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# THE GYNECOLOGY OF OBSTETRICS

AN EXPOSITION OF  
THE PATHOLOGIES BEARING DIRECTLY  
ON PARTURITION

BY  
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TO MY UNCLE  
WILLIAM KINGSTON VICKERY  
WITH WHOSE AID AND  
COUNSEL THE FOUNDATION WAS LAID  
THAT MADE THE WORK POSSIBLE  
I GRATEFULLY DEDICATE  
THIS BOOK



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## FOREWORD

*The majority of the patients who come to the gynecologist for advice suffer from the effects of injuries sustained during labor. Often the actual pathology involved has not been recognized, or, if recognized, has been underestimated by the general practitioner. Not infrequently the patient has been advised, and that even by men whose experience should dictate otherwise, to wait until the child-bearing period is over before submitting to operative repair.*

*No fatal outcome is to be expected from the lacerated cervix or the relaxed vaginal outlet, but these conditions may not only prevent the desired increase of family by sterility or miscarriage, but may compel the individual to drag out an existence of ill-health.*

*From the surgical standpoint the lacerated cervix and the relaxed vaginal outlet are considered minor procedures; but from the standpoint of the woman's well-being they are of major importance. These minor operations are often lost sight of in the desire to do the more spectacular major work, when frequently the condition requiring abdominal operation is the result of the injuries. Abdominal work is often simpler and easier of accomplishment than the repairing of vaginal injuries.*

*Price, of Philadelphia, always held that the skill required for the proper performance of correct plastic work should be developed by men specializing therein. Such was his opinion of the less spectacular minor surgery of gynecology.*

*A desire to be able to present to the students under my instruction a more graphic and detailed account of the structures of the female pelvis and outlet than I was able to gather from*

*text-books led me, when the opportunity of obtaining normal material presented itself, to take up a careful anatomical study.*

*I soon realized that there was no conformity between the actual findings and the text-book descriptions. The recognized anatomies deal very superficially with the female pelvis, and the gynecologies, as a rule, copy those authorities.*

*I hoped by this study as well to find some reason for the generally poor understanding by the physician of the relaxed vaginal outlet and the often unsatisfactory immediate and secondary repair. The result is that I have written the chapter on anatomy wholly from my dissecting-room findings, with the main emphasis on the points that most interest the surgeon.*

*The minutiae of muscle-fiber distribution and details of no moment to the accurate surgical correction of injuries have been omitted. This I have done with the hope of being able to present a vivid mental picture of the important relations that the operator must have while doing perineorrhaphies and other plastic work.*

*For the opportunities to prosecute this dissection work, I desire to express my appreciation to Dr. R. O. Moody, Associate Professor of Anatomy at the University of California.*

*The anatomical study naturally carried me into the details of histology, and thence to the pathological findings, for I felt that the average gynecology did not contain a sufficiently complete series of illustrations to avoid the necessity of reference to histology and pathology text-books, which, as a rule, give only a small space to the gynecological field.*

*The illustrations are all original, from specimens selected to represent as typical a series as possible, and the microphotographs represent the main diagnostic points. For some of the slides from which these photographic reproductions are made*

*I desire to thank Dr. Ludwig Pick, of Berlin, with whom I had the pleasure of taking up some of this work.*

*The anatomical findings, I found, were poorly portrayed by black-and-white plates, so color photography was resorted to. Anilin dyes to color the structures to be emphasized were used to get the required contrast. These color plates give much greater depth of focus with better contrast than ordinary photographs.*

*The impossibility of enlarging such plates in reproduction has necessitated the present size, though I realize larger illustrations could be more easily studied. For the great interest and care taken in the reproduction of these color photographs, as well as in the production of the 200-mesh half-tones, I wish to express my appreciation to Mr. E. F. Russ and his workers of the Sierra Art and Engraving Company.*

*In addition, I have taken up a comparative study of the accepted operative procedures of plastic work, discussing them with the data obtained in the dissecting-room as a foundation.*

*I have eliminated as far as possible the present tendency to discuss gynecological operations under a nomenclature of surgeons' names. While it is only just to give credit to any individual who introduces a worthy surgical procedure, the desire of many to obtain credit for an operation which adds a modification of only slight variation that in no way changes the principles involved must be confusing. To the student such individualization makes the average text-book of gynecology merely a mass of operations from which he may have difficulty in gathering the correct principles, so that he gets no appreciation, or at best a poor one, of the real factors at fault and to be corrected.*

*I have no new operations of my own to discuss. I may have taken away credit due to some one; but, if so, it has only been*

*because I have attempted to take up this narrow but important section of gynecology and discuss it from the basis laid down in the chapters on anatomy and the mechanics of pelvic defects.*

*If the effort put into this monograph will emphasize the greater importance that the correct trachelorrhaphy and perineorrhaphy have to the physical and mental well-being of the mothers, I shall consider the time well spent and shall offer no apology for adding to the already voluminous medical literature.*

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## ANATOMY OF THE CERVIX AND PERINEUM

WHEN we consider the female pelvic structure and organs in the light of the functions for which they are designed, the wonder is that any woman can go through the physiological ordeal of childbirth without having some untoward effects. The uterus, which in its state of rest is not larger than the individual's fist, must increase in size and capacity sufficiently to retain a full-term child as well as reserve energy enough, in spite of its excessive distention, to expel the contents. The birth canal must so change its character as to accommodate a body many times the size of its caliber at rest, and yet not interfere too greatly with the adjacent structures through and along which the canal lies. These adjacent structures have of themselves important duties to accomplish that require varying degrees of area.

The structure of the female pelvis is designed to permit of extreme distention of its contained canals without sustaining injury under normal conditions. In conditions varying from the normal, some of the structures, on account of the nature of their location and character of their duties, are more subject to strain; consequently, the abnormal status does not have to be marked to accomplish some injury. While nature in all cases does its best to remedy any resulting defect, nature undirected often fails, especially when handicapped by mechanical interference or infections.

The modern life of woman tends to crowd her mental culture at the expense of physical development during the period of puberty. This is associated with a type of dress that insufficiently protects the extremities and upper trunk, with a consequent exaggeration of the venous blood supply in the pelvis. These factors favor the occurrence of abnormalities before and during pregnancy and their persistence thereafter. Improper body posture, often exaggerated by poorly fitted or improperly adjusted corsets and defective shoes, also has its influence in the same direction.

The structures that are most subject to injury, and in which such injury is most likely to persist, are those of the cervix with its sur-

rounding tissues, the pelvic diaphragm, and the outlet. From the nature of its structure and location, the uterus itself is only occasionally the site of injury. The vaginal canal, on account of its relatively large caliber, permits of fairly easy distention. With its mucous membrane arranged in columns and rugae so as to be capable of covering a much larger area, the relation between the



The normal cervix at a point above the junction of the ventral vaginal wall. At this point the cavity is considerably widened, with the walls nearly in apposition. The stratified squamous epithelium covers the portion that is free in the vagina.

mucous membrane and the deeper structures is maintained in spite of the difference in the nature of the component elements. Consequently, injuries to the vagina itself are less frequent; and, if they do occur, they tend to repair themselves, on account of the contracting power of the muscle and elastic fibers composing the wall and the mechanical arrangement of the mucous membrane.

In using the term *cervix* throughout this monograph, I shall always refer to what should technically be known as the vaginal

portion of the cervix. The true cervix is that portion of the uterus beyond the plane at which the peritoneum reflects upon the bladder. It is at this plane that the constriction of the uterine cavity known as the internal os occurs. The cervix extends through the vaginal vault, as it were, with a slight ventral curve to the external os. That part of the uterus lying in the vagina is known as the vaginal portion of the cervix. The os is so situated that it points directly toward the hollow of the sacrum and meets the tactile end of the supine examining finger. Any variation from this location indicates an abnormal position of the uterus, an abnormal relation of the true cervix to the body, a displacement of the uterus from pressure by some outward mass, or a distortion of the cervix itself by scar-tissue contraction. In a retrodisplaced uterus the os, as a rule, points in the direction of the vaginal canal. By some this is given as a point diagnostic of retroversion, with the result that the careless examiner is apt to overlook a condition of marked anteflexion, especially where the body cannot be easily palpated.

The vaginal portion of the cervix varies considerably in size in different individuals. We find all variations, from the small conical cervix of the girl with an anteflexed uterus to the large hypertrophied cervix of the woman with a chronic endocervicitis, or vaginal prolapse. The anteflexed uterus is a persistence of what in premenstrual life is a normal flexion of the cervix and body, but which, when inflammation is present, causes the patient to suffer from dysmenorrhea, leucorrhea, and possible sterility—an entity spoken of as anteflexion. A normal intravaginal cervix is about three-fourths of an inch in length and about an inch in breadth, tapering somewhat toward the truncated end, where the external os is situated. The thickness is a little less than the breadth. The os is a circular opening about one-eighth of an inch in diameter; and if an imaginary line be extended across the os it divides the cervix into a ventral and a dorsal lip. The ventral lip is somewhat shorter, but meets the examining finger first, on account of the relation of the vault of the vagina to the horizontally placed uterus.

The supravaginal portion of the cervix is about three-quarters of an inch long and of slightly greater dimensions than the intravaginal, narrowing somewhat at the junction with the corpus, or body,



An enlargement of the normal stratified squamous epithelium of the vaginal cervix.

nal is somewhat fusiform in shape, the narrowest portions being at the internal and external ora. In cross-section it represents a flattened oval, the walls not being in as close contact as in the body. The mucous membrane differs from that in the uterine cavity, in being somewhat denser, on account of a greater amount of fibrous tissue in its structure, and in possessing a higher layer of columnar epithelium, and, most important of all to the medical man, mucous glands that are larger, more branching than in the uterine body mucosa,

of the uterus. This portion of the cervix is attached to the fundus, or base, of the bladder in front, yet with a fairly well-marked cleavage line. Behind it is covered by the peritoneum of the pouch of Douglas and laterally by the base of the broad ligaments.

#### The cervical ca-

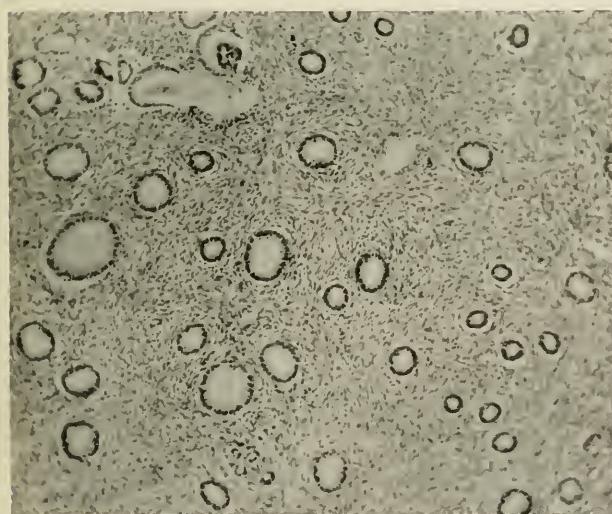


A segment of the transverse section of the cervix more highly magnified, showing the character of the lining membrane of the cavity with the penetration into the deeper tissues of the cervical glands. The deep location of the branches of the glands shows the impossibility of removing any but the very superficial tissue by a curette.

and of racemose instead of tubular type. These glands are longer, and often extend their blind ends in between the muscle fibers. Their secretion, unlike the thin, watery fluid from the body glands, is a clear, exceedingly tenacious mucus, which in inflammations of the cervix forms the plug so difficult to remove. The obstruction of the orifices of the cervical glands allows the collection of the contents, resulting in what Naboth described as "ovules." These retention cysts frequently reach the size of a small pea, and show beneath the vaginal mucous



A still higher magnification of the lining membrane of the cervix, showing more in detail the single layer of cells with the basement membrane that forms the covering of the epithelial layer.

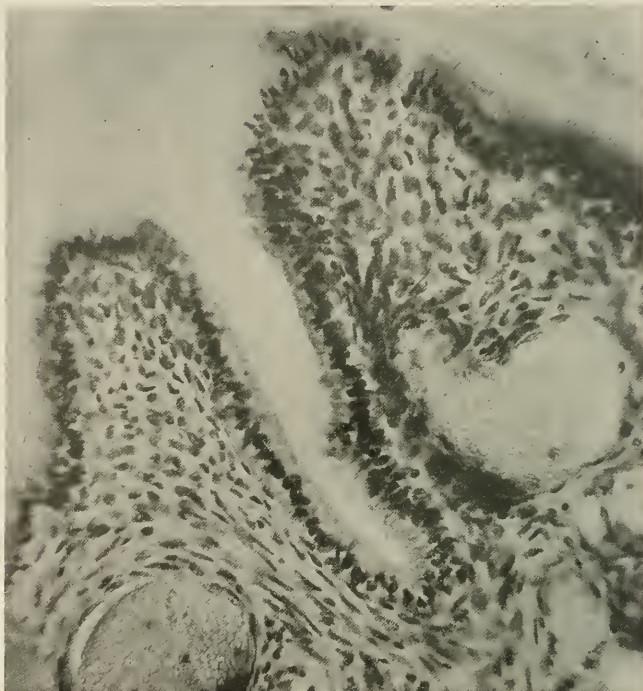


A cross-section of the normal cervical mucous membrane that shows the character of the gland structure and the proportional relation to the interstitial tissue.

membrane as hard rounded nodules, whitish yellow in appearance where the pressure has thinned the mucous membrane.

The lining of the cervical canal has upon its surface a ventral and a dorsal longitudinal ridge from which depressions run obliquely, as the branches from a tree. This forma-

tion is known as the "arbor vitae." At certain times of the menstrual cycle the epithelium is described as ciliated. The transition from the cylindrical epithelium of the canal to the stratified squamous epithelium covering the vaginal surface is abrupt at the os, so that in tears of the cervix the columnar epithelium becomes exposed and subject to friction and erosion. The main structure of

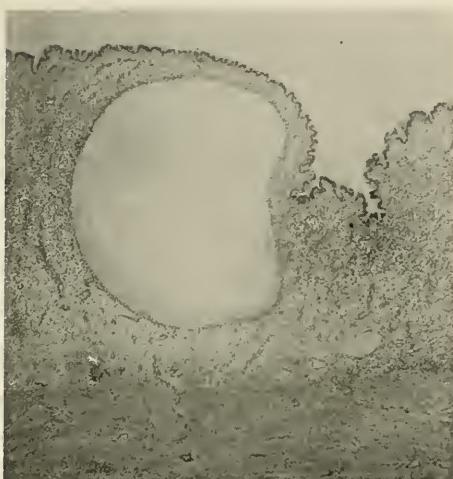


This specimen is intended to serve as a comparison for the later illustrations that show the early indications of malignancy. Where the cells are cut at a right angle, the uniform character of the cells with the type of basement membrane is typical of the normal cervical lining. The vascular character of the endometrium is well shown by the blood-vessels close to the epithelial covering.

the cervix consists of the involuntary muscle tissue arranged in layers surrounding the canal, with some oblique bundles of fibers but no longitudinal layer. The muscle is intermingled with a considerable amount of dense fibrous and elastic tissue, which accounts for the greater resistance and hardness of the cervix over the body.

The nerve supply of the uterus, being designed for the control of

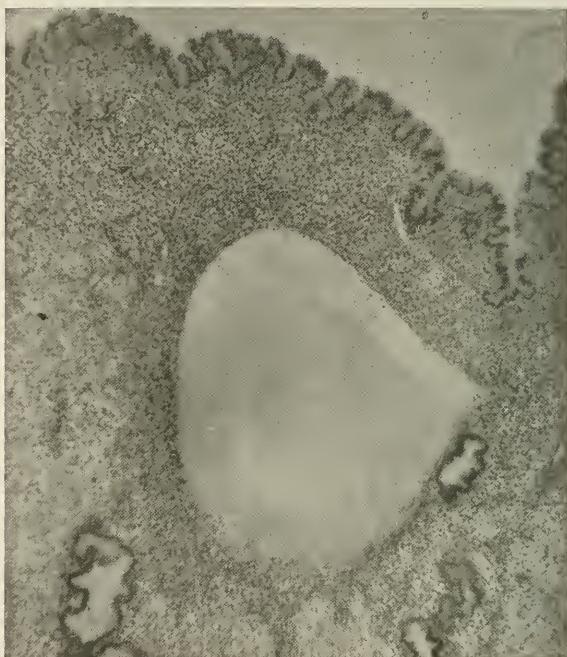
the involuntary muscle fibers, is abundant. The nerves are of large size, to correspond to the highly developed myometrium. According to Piersol, they are derived from the sympathetic nervous system, as a continuation from the hypogastric plexus through the pelvic plexus, combining with branches from the second, third, and fourth sacral spinal nerves. The ganglia, though numerous, are small. The largest is the "cervical ganglion." This receives fibers directly from the spinal nerves and is situated behind the upper portion of the vagina. Thence, through the broad ligament associated with the blood-vessels, this cervical ganglion supplies the uterus, the major portion supplying the muscle cells. The character of the nerve supply and the relatively smaller number of fibers to the cervix, together with the large amount of fibrous and elastic tissue, have been given as the reason for the comparative lack of sensation in the vaginal cervix, which permits us to grasp the lips without causing pain. According to Poirier and Charpy, the nerves of the uterine neck are more numerous and thicker than those of the body, and the statement that there is feeble



Since it has been shown that all the microscopical findings supposed to characterize the various forms of endometritis are found in the normal uterus during the menstrual cycle, the only point at the present time that is considered diagnostic of chronic endometritis and endocervicitis is the round-cell infiltration. The inflammatory process is sometimes sufficient to cause obstruction to the glands, either through pressure on the outlet or change in the character of the secretion, producing a cystic condition designated as cystic endometritis or endocervicitis.

sensibility is inexact. It is well to bear in mind that by applying the vulsellum slowly and steadily the gradual pressure anesthetizes the mucous membrane. We thus avoid practically all sensation, except when the cervix is excessively inflamed. The single-pointed tenaculum causes just as much sensation as the small double-tooth vulsellum, and is very much more likely to pull out, thus giving a torn, bleeding cervix and often necessitating a reapplication.

The dorsal lip of the cervix has less sensation than the ventral, and, as a rule, is just as convenient to grasp. In replacing a retro-displaced uterus and applying a pessary, the dorsal lip is the more convenient, for the vulsellum acts as a guide, thus directing the upper bar behind the cervix. In a case of badly lacerated cervix, if



A higher magnification of a cystic endometrium that shows the round-cell infiltration. The glands are all more or less enlarged, though the number appears relatively decreased on account of the increase of interstitial tissue. The main cavity has lost its epithelial lining, as will occur from excessive internal pressure.

the ventral lip is grasped, the pessary may slip into the cleft and be rather difficult to dislodge to its dorsal position, especially if it is necessary to use one with a sharp curve.

The blood supply of the cervix comes mainly from the uterine artery, which, at the level of the internal os, gives lateral branches running in front and behind, which anastomose to form the circular artery of the cervix as well as another branch—the vaginal artery, which passes downward to supply the vagina and cervix. It is from

these vessels that the only bleeding of importance is likely to occur in injuries at confinement or operations on the cervix. As a rule, the first sutures placed laterally at the depth of the wound readily control such bleeding.

In all operative work on and around the cervix the adjoining structures have to be borne in mind. The most important of these are the bladder and ureters. In simple operations on the cervix these, as a rule, are not likely to be injured. In some cases of cystocele, associated as they often are in old women with an atrophic cervix, the vaginal and bladder walls are excessively thin and the bladder is very close to the os, on account of the small ventral lip. Again, in uterine prolapse the bladder is carried down with the cervix, and may be entered in doing plastic work on the cervix. A sound introduced into the bladder and turned toward the cervix will locate the reflection of the bladder and help to avoid such injury. It is only in the removal of the uterus, in high amputations of the cervix, in resection of the vaginal vault, or in the separation of the bladder from the uterus, as in the interposition operation, that the ureters are likely to be encountered. In severe injuries of childbirth, the ureters are occasionally involved, giving rise to ureteral fistulae.

The ureters having their termination at the upper and outer angles of the bladder trigone, are thus situated apart about a width and a half of the cervix, where they are in close proximity to the vaginal vault. From there they diverge rapidly outward and backward in the base of the broad ligament, so that at the lateral aspect of the cervix they are about three-quarters of an inch, or two centimeters, away, and are here crossed by the uterine arteries. Still diverging, they pass retroperitoneally, so that as they cross a line drawn between the two anterior superior spines they have reached their widest separation at the pelvic walls, and are here one and three-quarter inches approximately from the lateral aspect of the cervix. Running upward and slightly inward on the natural slope of the pelvis, the ureter meets the internal iliac vessel before its division, accompanying it, but situated ventrally, until, at the pelvic brim, the common iliac artery is crossed just about at the bifurcation. In cases where the abdomen is opened, the ureters may be

made more visible by stroking the peritoneum covering them. This irritation causes a peristaltic contraction of the muscle fibers and makes the structure more easily visible and palpable.

The danger of injury to the rectum is slight if ordinary care is used, for between it and the cervix is imposed the double layer of peritoneum.

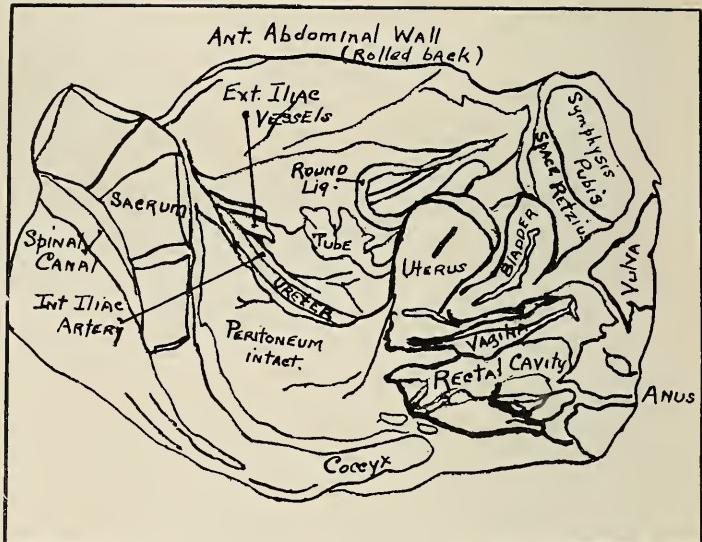
The lymphatics are of interest in connection with cancer formation. According to Piersol, those from the cervix form two to four large trunks that follow the uterine artery and veins outward, and, lying in the lower and outer part of the broad ligament, pass to lymph nodes occupying the angle between the external and internal iliac arteries.

The vaginal canal runs cephalad and dorsad at an angle of about sixty degrees to the perpendicular with the patient in the dorsal position. It is well to bear in mind that the direction of the canal does not change its relation to the patient when any other posture is assumed, but always is directed toward the hollow of the sacrum. The remembrance of this relation will facilitate the introduction of the speculum and prevent impinging on a possibly sensitive ventral vaginal wall.

The vagina is a collapsed tube with the upper and lower walls in apposition. On account of the relation of the uterus, the ventral or upper wall is about an inch shorter than the dorsal. The lower portion of the canal dips into the vulva as does the cervix into the vagina, and here is the narrowest portion of its caliber, the upper portion of the canal being several times larger. The columns and rugae into which the mucous membrane forms, and the circular muscle fibers with the large quantity of elastic tissue composing the walls, permit of extreme distention without injury. The vagina is in close contact with the urethra and bladder in front and the rectum behind, but separated therefrom by a well-defined fascia layer, to which both organs have a rather loose connection, with well-defined cleavage lines. In the normal individual this fascia has as great a strength as the fasciae of the abdomen; and the blending into other fascia layers at the lateral attachments to the pelvic wall is well marked and of great support value. As we shall see later, these fasciae in injury resulting in cystocele and rectocele become

PLATE I

A MEDIAN SECTION THROUGH THE FEMALE PELVIS  
AT THE SYMPHYSIS PUBIS—THE PELVIC  
ORGANS ARE IN NORMAL RELATION



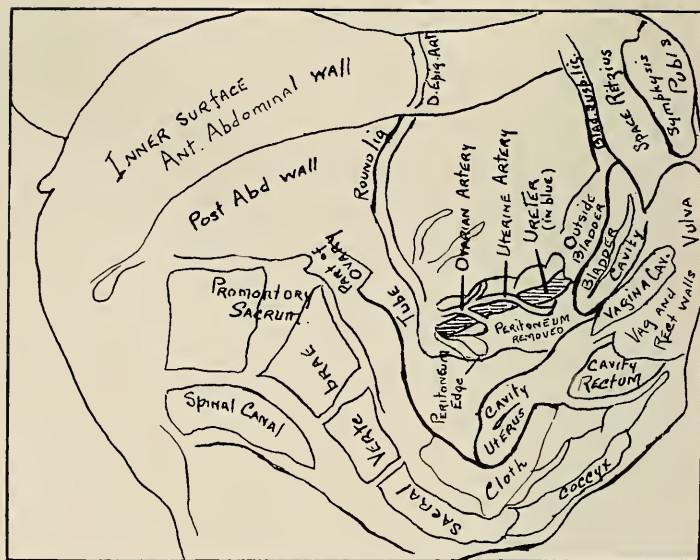
The median section of the female pelvis. The peritoneum removed from over the brim of the pelvis and ureter shows the internal iliac artery in its relation to the ureter. The beginning portion of the external iliac vessels is shown with peritoneum removed. The course of the external iliac vessels along the brim of the pelvis is outlined beneath the peritoneum where the round ligament runs toward the inguinal canal.





PLATE II

A MEDIAN SECTION THROUGH THE FEMALE PELVIS  
AT THE SYMPHYSIS PUBIS — THE UTERUS  
DISPLACED IN ORDER TO SHOW THE  
RELATION OF THE URETER TO THE  
UTERUS AND BLADDER



A longitudinal section through the pelvis. The surfaces of the bladder, uterus, and vaginal walls have been colored red. In the upper field the peritoneum reflection from the bladder has pulled away from the pubic symphysis, exaggerating the space of Retzius. The uterus is retrodisplaced in order to put the left broad ligament on tension. The peritoneum over the ventral surface of the broad ligament is removed exposing the uterine artery and the ureter to its entrance into the bladder. The round ligament, colored red, is shown in its course to the inguinal canal. This illustration takes up the course of the ureter beneath the broad ligament at the point of disappearance in the preceding plate.





excessively thin, but on account of the strong lateral attachments must not be neglected in the repair work.

The mucous membrane of the vagina is of the stratified squamous type with few secreting glands and a submucous layer loosely attaching it to the muscle layers. The muscle wall consists mostly of circular fibers, with only a few longitudinal, intermixed with a large amount of elastic tissue. The blood supply comes wholly from the internal iliac arteries through various channels. The upper part of the vagina is supplied by the cervical branches of the uterine artery—these, running down, communicate with branches from the middle hemorrhoidal and vesicovaginal that supply the middle and lower portions of the vagina respectively.

According to Piersol, the nerves to the vagina are from the same source as those to the cervix, except that, at the lower portion and toward the orifice, some fibers coming from the pudic nerve endow the mucous membrane of the lower third with greater sensibility and send motor filaments to the striated muscles surrounding the entrance. Consequently, the upper part of the vaginal canal possesses sensibility only of the same moderate degree that is found in the cervical structures.

Anatomists differ not only regarding the nerves, but also regarding the lymphatics. According to Piersol, the lymphatics within the mucous membrane form a close network that communicates with the lymph-vessels of the muscular coat. The collecting branches from the upper and middle thirds of the vagina, in company with those from the cervix, pass chiefly to the lymph nodes along the internal iliac artery. Some from the posterior vaginal wall go around the bowel and terminate in the rectal and lumbar nodes. The lymphatics from the vicinity of the vaginal orifice pass chiefly to the upper median groups of inguinal nodes; a few, however, go the same course as the ones from the upper vagina.

The vagina, with the urethra and rectum, pierces what is known as the pelvic diaphragm and exits through the pelvic floor into the vulva. The pelvic diaphragm consists of a muscle called the levator ani, with a fascia layer above and below. In three normal subjects, the number so far dissected, I have found that these layers are pretty thoroughly blended with the muscle fibers. The deeper fas-

cia, which is known as the rectovesical, was in these subjects more loosely attached and more of a sliding layer than the lower or so-called anal fascia.

The rectovesical fascia is a direct continuation of the pelvic fascia, and takes its origin from where the pelvic fascia spans the obturator muscle between the two bony attachments—one on the inner surface of the pubic bone, and the other on the inner surface of the ischial tuberosity. This bridge is reinforced with more fibers, and is known as the “white line.” From this and the bony attachments arises the levator-ani muscle. The pelvic fascia, while ending in name at the “white line,” in reality continues on below the rectovesical reflection, and at a slightly lower level again splits into two layers—one closely blending with the under surface of the levator-ani muscle to form its lower covering, and known as the anal fascia, the other closely covering the obturator-internus muscle, and known as the obturator fascia.

On account of the divergence of the pelvic diaphragm from the bony structures, the anal and obturator fasciae rapidly increase their distance apart. The resulting space between them and down to the pelvic floor, where the divergence is widest and where the blending of these layers with the triangular ligaments takes place, is loosely filled with fatty tissue. This pyramidal space is the ischio-rectal fossa.

Dr. Irving S. Haynes, of New York, in a paper on “The Anatomical Basis of Perineal Repair,” describes the fasciae as follows:

“If the anal fascia has been removed and the lower surface of the levator ani exposed, by gently using the fingers or the handle of a scalpel, it will be found that the levator ani and the parietal pelvic fascia are easily separated as one layer from a more external layer of fascia, which is the ‘true’ obturator fascia. This layer covers the obturator muscle and is attached to bone and ligament all about its margin, viz., along the iliopectineal line, to the upper margin of the obturator groove and to the inner surface of the pubis, below to the spine of the ischium, to the great sacrosciatic ligament, tuberosity of the ischium and the ischiopubic ramus.

“The inner layer is the parietal pelvic fascia, which for its upper attachment follows the same lines as the true obturator fascia

does, but after the limits of the obturator muscle are passed, extends over the pyriformis muscle as the pyriformis fascia, and is in this region attached to the posterior portion of the iliopectineal line, the front of the sacrum, the great sacrosciatic ligament and the spine of the ischium. This fascial plane drops downward and is called the parietal pelvic fascia until a point is reached where it is thickened by the addition of some fibers running anteroposteriorly from the inner surface of the pubis to the spine of the ischium, the so-called 'white line'; below this line the fascia is called the visceral pelvic fascia, and it is disposed as previously given. There is thus formed a continuous plane or layer of fascia, the upper part of which is usually described as the parietal pelvic fascia and the lower portion as the visceral pelvic fascia, but the two portions are really continuous with each other without any mark of separation except for the thickening at the 'white line,' but they are separated from the true obturator fascia. The origin then is usually given for the visceral layer of the same as well.

"The levator ani shows two distinct portions, the iliococcygeus and the pubococcygeus (puborectalis).

"The iliococcygeus is the portion arising from the 'white line.' It is inserted into the side of the rectum, the anococcygeal raphe or ligament and the coccyx.

"The pubococcygeus arises from the inner surface of the pubis, passes backward alongside of the vagina to be inserted into the tendinous center of the perineum, and sweeping around the rectum, it terminates in the anococcygeal ligament and coccyx. This portion of the muscle deserves further notice. Its fibers form a strong band (about three-eighths of an inch wide) which hugs the vaginal orifice very closely (forming the lateral compressor of the vagina), and is inserted in a 'Y-shaped' manner. One leg of the 'Y' terminates in the central tendon of the perineum, the other leg of the 'Y' encircles the rectum and ends in the anococcygeal ligament."

In my three dissections of the normal female pelvis the levator ani has been divided into three distinct segments. One, the smallest and most ventral, and having its origin mainly from the pubic bone, runs downward and inward across the upper portion of the pubic arch to be attached into the side of the urethra and vagina. As is shown by these dissections and the operative findings, the middle portion, frequently overlapping the dorsal edge of the ventral segment, is also attached to the sides of the vagina, even as

high as an inch in some individuals. It sends a well-defined bundle of fibers between the vagina and rectum.

The third and larger section of the muscle is continuous with the dorsal edge of the middle segment at its point of origin, but frequently is overlapped by that segment toward the median line. All of its fibers go behind the rectum and form a sling for that structure. It is on the upper surface of this section that we find the loosest attachment of the rectovesical fascia.

The attachment of the levator ani to the sides of the vagina and the band of fibers running between the vagina and rectum are denied by some gynecological writers; but, so far, in every case of uninjured perineum the findings have been constant and the evidence presented in the illustrations is incontestable. Poirier and Charpy are also authority for the same statement. It is this lateral attachment that prevents the prolapse of the lower segment of the vagina in procidentia.

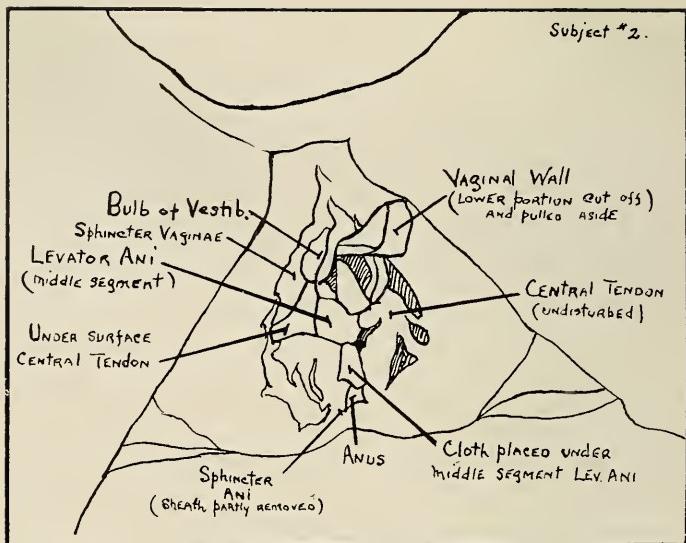
The gynecologist deals mainly with distorted anatomy; the anatomist does not always have the surgical point of view; and so it is not always possible to correlate the descriptions found. This is emphasized too by the fact that in individual cases the normal anatomical findings vary. But it is on the recognition of these findings in the pelvic diaphragm and their proper application that the success of plastic work upon that and the outlet will depend.

The attachment of the levator ani is mainly in a central raphe, the ventral portion also attaching to the sides of the urethra and vagina and the dorsal segment to the sides of the coccyx. This median raphe blends into what is known as the pelvic floor, making it almost impossible to separate the structures without cutting. This blending of the diaphragm and floor is another anatomical fact not generally recognized in considering perineal injuries and repairs. There is a small triangular gap left in this diaphragm, with its base at the sides of the sacrum and coccyx and its apex at the spine of the ischium. This gap is filled in by a muscle variously described as the coccygeus or ischiococcygeus, and which has little importance from the gynecological aspect.

By most anatomists the levator ani is described as one muscle without definite segments, and in his work on anatomy Piersol

PLATE III

SEGMENT OF THE LEVATOR-ANI MUSCLE  
RUNNING BETWEEN THE VAGINA  
AND THE RECTUM



In this section the lower portion of the vaginal wall has been partially cut away and pulled to the side in order to get it out of the field. The central tendon is cut through, and the segment of the levator ani between vagina and rectum is intact over the strip of cloth.

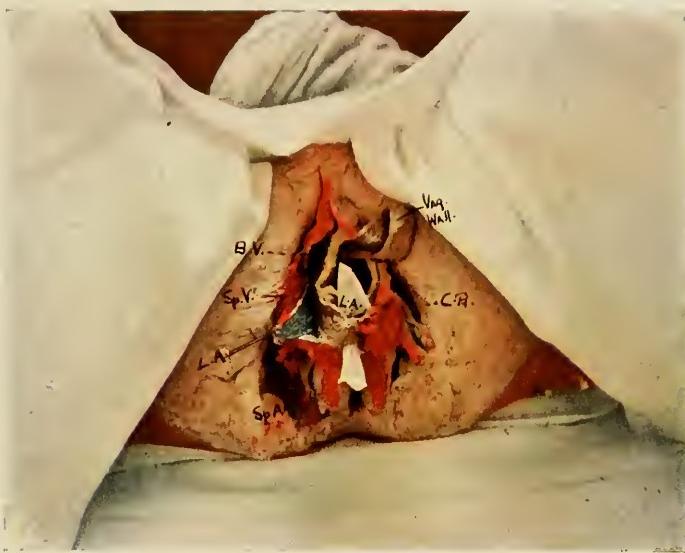
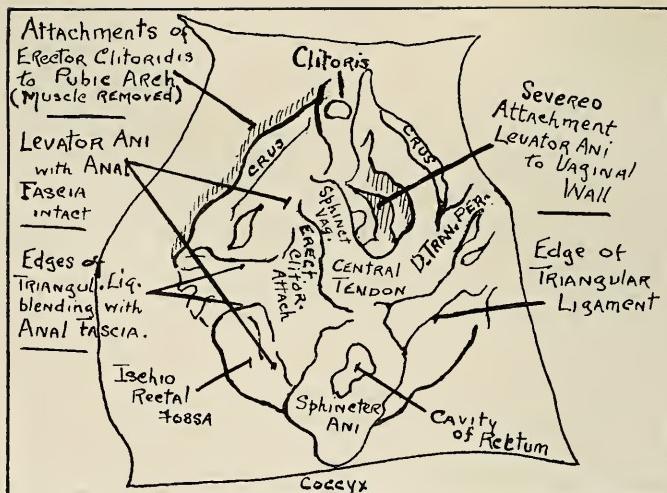


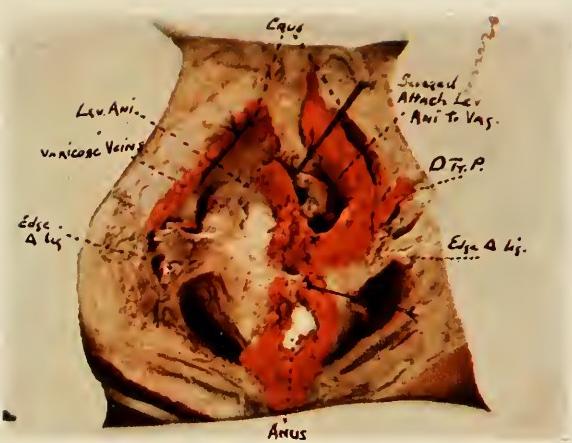


PLATE IV

THE PELVIC DIAPHRAGM AND THE ATTACHMENT  
OF THE LEVATOR-ANI MUSCLE TO THE  
SIDE OF THE VAGINA



All the structures on the subject's right have been removed down to the "pelvic diaphragm." The relation of the muscle and the anal fascia to the median line of the pelvis with the blending into the superficial structures is shown. On the other side the dissection has been carried between the levator ani and the vagina, in order to show the attachment between the two. In this case, on the left side the separation of the sphincter vagina into superficial and deep has not been possible.





thus describes it. But under the heading of "Variations" he makes the following statement:

"The levator ani is always a well-developed muscle, although the extent of its attachment to the sides of the coccyx varies inversely to the attachments of the coccygeus to that bone. There is usually to be found a dividing line extending across the muscle on a level with the junction of the superior ramus of the pubic with the ilium and separating those fibers which are inserted onto the coccyx and the posterior portion of the fibrous raphe from those which pass to the anterior part of the raphe and the rectum. Each of the portions so separated is supplied by a separate nerve, and this, combined with the results of comparative anatomy, seems to show that the posterior portion of the levator is really a muscle quite distinct from the anterior portion. It has been termed the *m. iliococcygeus*. Furthermore, it seems probable that the anterior portion is composed of two morphologically distinct muscles, one of which arises from the pubis and anterior part of the 'white line' and is inserted into the median fibrous raphe, whence it is termed the *m. pubococcygeus*, while the other, situated beneath—i. e., superficial to the pubococcygeus—consists of those fibers which arise from the pubis and are inserted into the rectum, and is termed the *m. puborectalis*."

In my dissections the muscle has been distinctly divisible into the three segments as described, and in each case, as is well shown in the illustrations, the edge of the individual segment is distinct and overlapping, with a definite space between. In each subject the attachment of the ventral and middle segments to the vagina has been most marked, and yet the anatomy text-book fails to mention the fact, even under "Variations." It is extremely important to the gynecologist in accounting for the various conditions resulting from the relaxed vaginal outlet to bear this anatomical relation in mind, for upon a proper understanding of this relation will depend the correct results in plastic work.

Those structures which fill in the area between the pubic arch in front and the edge of the *gluteus-maximus* muscles behind are spoken of as the pelvic floor. The structures composing this floor are variously described by different authorities, and in reality they vary rather markedly in different subjects. In some cases the muscles are well marked with large well-defined bellies, but rather

at the expense of the fasciae. In others the fascia layers are the most prominent, while some of the muscles are poorly defined; but in all cases the muscle tissue forms a large element of support. The central tendon in some women contains an excessive amount of elastic tissue, the presence of which may account for lack of injury to the pelvic floor in childbirth. This will naturally not prevent the levator-ani injury, and may deceive the obstetrician as to the extent of the vital injury.

This variation of composing elements probably accounts for the difference of opinion of gynecological writers as to the value of one element over another for building a perineal support. Physiology tells us that fasciae will always stretch under continued tension if no rest is given, and it is only by rest that they can recuperate; whereas muscle tissue develops with exercise, but only within certain limits. Consequently, all over the body where strength is required but where variation in area is necessary we find both muscle and fascia closely associated and often blended.

Where excessive stretching has occurred, a tearing of the fasciae has resulted, possibly without muscle rupture, and, consequently, by excessive elongation, the muscle cannot function. By shortening up the fasciae, and thus giving the muscle a new point of attachment, it is again set to work and develops strength, and this is the mechanism of a successfully repaired pelvic outlet. Consequently, both the surgeon who emphasizes the importance of the fascia and the surgeon who emphasizes that of the muscle are correct, but only in part. When it comes to muscle rupture as well as fascia injury, the retracted ends of the vaginal portion of the levator ani become imbedded in scar tissue. That, however, is a factor which will be considered more fully under perineal repairs.

The pelvic floor, ventral to the tuberosities of the ischia, practically consists of three layers of fascia, between which are situated muscle layers; and these layers, pierced by the urethra and vagina, may be considered as bridging the area within the pubic arch. Dorsal to this line is found one layer of fascia, for here the same amount of structural support is not necessary and greater possibility for expansion must be allowed. The superficial layer of the outer fascia is closely blended to the skin, and cannot be considered

of much value from the surgeon's standpoint other than in serving to prevent the movement of the skin on the deeper structures as well as supplying some support. It is a continuation of the superficial fascia of the thigh and abdomen. On the removal of the skin with this fascia, we come to the first layer of fascia, described as one of the three support layers. This fascia is commonly known as Colles's fascia. It is a firm, well-defined layer bound down to the pubic arch. This layer is continuous mesially in some subjects with the fascia surrounding the vagina and urethra. In other subjects the blending takes place in the median line with the muscle tissue, and a direct connection cannot be traced with the internal fasciae. The removal of this layer exposes the first muscle structures of the pelvic floor and their central tendon attachments. This fascia is closely attached to the dorsal edge of the triangular ligament.

The most important of these muscles are the two sphincter vaginae, or bulbocavernosi, which have their origin at the ventral edge of the central tendon, and thence run forward, one on either side of the vaginal orifice and vestibule, dividing into three septa, which attach themselves, one to the body of the clitoris, one to the sides of the bulbs of the vestibule, and the ventral portion running over the clitoris and blending into the fasciae and suspensory ligament. In most subjects it is impossible to separate this muscle from the corresponding deeper muscle called the compressor vaginae except at the attachment to the central tendon. Since surgically such a separation is of no value, from this on the two will be considered as the sphincter vaginae. Corresponding to this muscle in the dorsal portion of the perineal region is the sphincter ani, arising at the dorsal edge of the central tendon, running around the anus, and attached to the coccyx. The body of the muscle is well defined and inclosed in a reflection of fascia spoken of as the sheath. Both muscles depend on the central tendon for one point of support, and so, in cases of injury to the central tendon, the muscles retract, and thus increase the distance between the anus and vestibule.

From the side of the central tendon outward, to be attached on the pubic arch a little forward of the tuberosity of the ischium, run the transversus perinei. The superficial are not always as well-

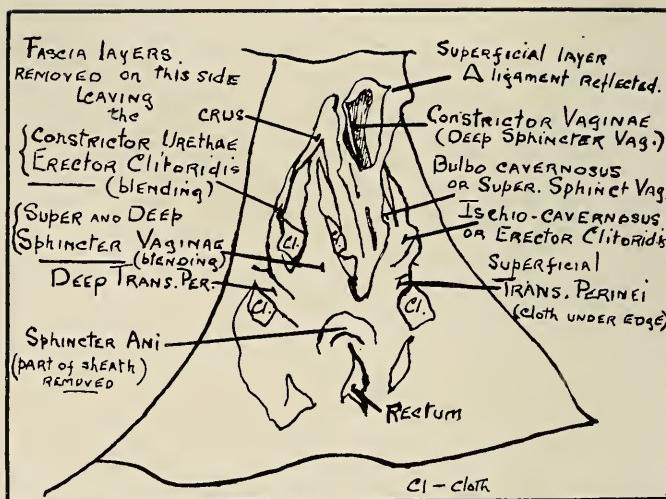
defined muscle bodies as the deep, which have relatively the same attachments, but are situated between the layers of the triangular ligament. In some subjects the combined muscles are as much as a quarter of an inch in diameter; and with the patient in the dorsal position, they run a little upward and outward from the horizontal. Between the central tendon attachments of the sphincter vaginae and transversus perinei superficial the erector clitoridis has its origin and then continues outward at the ventral edge of the latter muscle, filling in partially the triangular space between these muscles and the pubic rami. It passes over the crura and is inserted into the pubic rami. The greater portion of the muscle belly is toward the rami, so that a considerable gap is often left between it and the sphincter vaginae.

Beneath these muscles the superficial layer of the triangular ligament is stretched, blending, however, in the muscle gaps with Colles's fascia and the deep layer of the triangular ligament, so that in some subjects it is difficult to separate the individual layers, making it appear to be a heavy one-layer fascia that splits to inclose the muscle structures. In the median line the fascia blends with the lateral aspect of the sphincter vaginae, and this again with the rectovesical reflected layers surrounding the vaginal canal. At the bony boundary the fasciae are firmly attached, and here are readily separated into the various layers, with a considerable fraction of an inch gap between. At a line drawn from tuberosity to tuberosity, the superficial layer of the triangular ligament is reflected back around the deep transversus perinei and becomes the deep layer of the triangular ligament with the same lines of attachment.

Between these two layers occur the deep transversus perinei, the deep sphincter vaginae, or so-called constrictor vaginae, already described, and a third muscle, corresponding to the erector clitoridis, called variously the constrictor urethra, compressor urethra, or Guthrie's muscle, but not always well defined, especially if the superficial set of muscles are well developed. At the sides of the vagina and between the deep layer of the triangular ligament and the under layer of the anal fascia, blending with the levator ani, are situated the bulbs of the vestibule, one on either side. These

PLATE V

THE MUSCLES OF THE PELVIC FLOOR



On the left side the layers of the triangular ligament are dissected off the muscles. The superficial muscles (which in this subject were not so well defined) were unseparated. The right side of plate shows some ill-defined superficial muscle fibers (colored red). At the side of the clitoris the superficial layer of the triangular ligament laid over exposes the main ventral attachment of the so-called sphincter vaginae. Pieces of white cloth are laid under the muscles to emphasize their free edges.

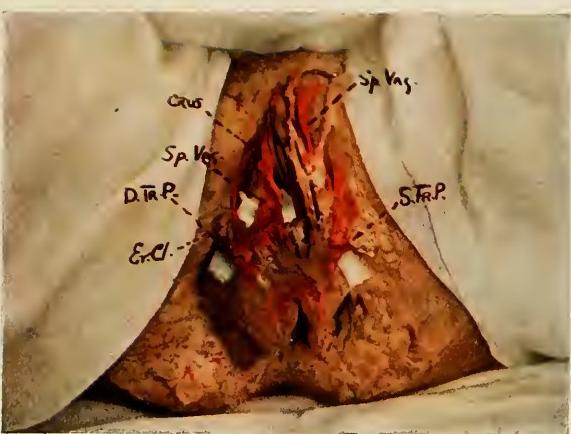
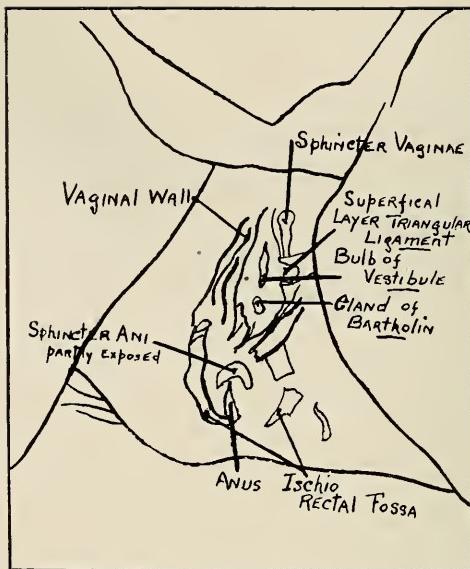




PLATE VI

THE GLAND OF BARTHOLIN  
THE BULB OF THE VESTIBULE



The dissection at the side of the vagina has been carried between the layers of the triangular ligament, in order to expose the gland of Bartholin (colored brown) and the vestibulo-vaginal bulbs (colored blue). The fascia layer dissected off the gland has been pulled aside over the cloth.





structures, composed of cavernous venous spaces, are about an inch and a quarter long, half an inch wide, and vary in thickness from one-eighth to one-quarter inch. To the inner side of these blend the anal fascia of the levator ani and the sphincter vaginae. Surgically, these structures are not of much importance, for from their situation they are seldom injured.

Two other structures, one on either side of the vagina, are of importance. These are the glands of Bartholin. They are compound racemose glands situated between the layers of the triangular ligaments and opening by ducts just external to the hymen. When normal they secrete a thin mucus as a lubricant against friction, and this is markedly increased under nerve stimulation. At the conclusion of micturition the contraction of the vaginal-sphincter muscles probably produces a more profuse discharge, as a protection against the urine. Not only are the glands of Bartholin of interest from the fact that they are subject to inflammation in gonorrhreal infection as well as occasionally to cyst and abscess formation, but the orifices, opening as they do midway in the vaginal slit, offer a landmark in perineal repair.

As a rule, the ventral relation of the orifice of the gland of Bartholin is not distorted in injuries of the outlet. Occasionally a ventral tear distorted by scar-tissue formation displaces the orifice backward, and care must be taken to avoid including the duct in the denudation for perineorrhaphy.

The urethra, running along the ventral vaginal wall, is separated therefrom by a well-marked fascia layer. Its orifice, situated in the vestibule, is twice the distance from the vaginal orifice as from the under surface of the clitoris at the frenum. The lateral boundary of the vestibule, being marked by a crease in the mucous membrane where the closely anchored vestibule membrane is reflected off on to the labia minora, gives us, with the midline location of the urethral meatus, definite landmarks, even if swelling is present and structures are distorted. In passing the catheter it is well to remember that the urethra is firmly attached to the pubic arch and that the direction of the canal is curved under the symphysis.

In extensive relaxation of the ventral vaginal wall with the bladder-sag, the urethra usually remains firmly attached at its lower

end to the pubic arch, but the bladder portion is displaced downward, so that the tip of the glass catheter, inserted first in the direction of the curve of the symphysis, must be pointed dorsally to reach the bladder cavity instead of in the continued ventral trend in the normal individual. In these cases where catheterization is difficult a glass of larger dimensions may usually be passed with ease, since the mucous membrane folds are thus straightened out.



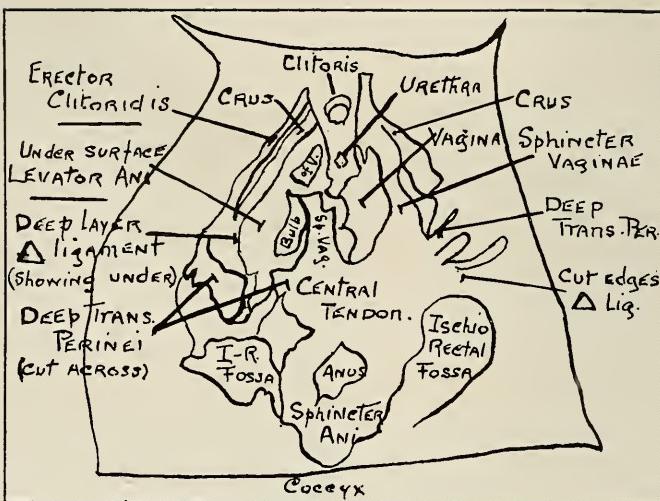
This illustrates a normal virgin vulva in a girl of sixteen. The labia minora are not fully developed. The tubercle of the vagina protrudes more than usual. The urethral orifice is placed comparatively high on account of the greater prominence of the vaginal tubercle.

fasciae of the pelvic diaphragm, so that in some cases it is not possible to find the cleavage line or separate the attachments of the levator ani from the sides of the vaginal sphincter or the attachment of the transversus perinei, where both run into the central tendon. The bundle of fibers running between the vagina and rectum, however, are usually free from the fascia covering and can be picked up between the fascia layers enfolding them. As the two

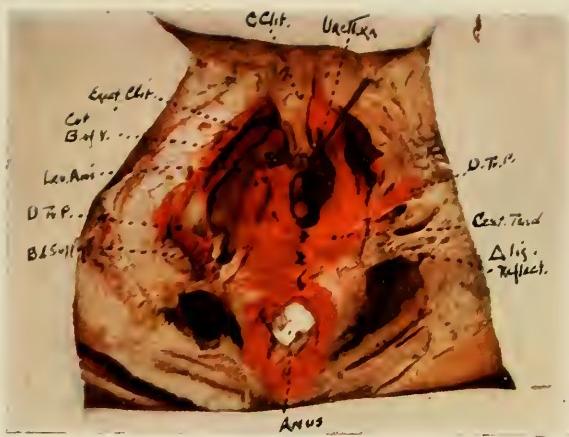
The rectum is separated from the fornix of the vagina by the folds of the pouch of Douglas. From these folds to the level of the pelvic diaphragm the layer of fascia attached to both structures is the only intervening element. Where the muscle of the pelvic diaphragm comes between the vagina and rectum, the rectum runs dorsally from there to the anal orifice for the last inch of its course. The introduction of the speculum is consequently ventrad and cephalad for the first inch, and then dorsad, following the hollow of the sacrum.

The fasciae of the pelvic floor in the median line are blended closely with the anal

PLATE VII  
THE ISCHIORECTAL FOSSAE



In this stage of the dissection the ischiorectal fossae have been cleared. The superficial and deep muscles on the left of the plate have been removed close to their attachments, exposing the crus, the bulb of the vestibule, and the anal fascia layer. The vaginal wall dissected from its surroundings dorsally and laterally has been drawn together and pushed inward.





planes (the diaphragm and the floor) run outward to the pubic arch, they become farther apart, so that at the pelvic wall they are separated by almost the width of the pubic bone. Between these layers we find the bulbs of the vestibule and the crura together with the blood and nerve supply. The rectal area already outlined is dorsad to the reflections of the layers of the triangular ligaments over the transversus perinei, and this area can be superficially defined by a line between the tuberosities of the ischia. In this region the only structures of importance, aside from the orifice of the rectum, with the external sphincter ani, in the median line, are the ischiorectal fossae. These two spaces are triangular in base as well as in elevation. Each base area is outlined in its common median line by the sphincter ani, ventrally by the "ischioperineal ligament" (as the edge of the triangular ligament is sometimes called), and on the third side by the gluteus-maximus muscle and sacrosciatic ligament. The elevation is bounded toward the mesad line by the lower surface of the rectal sling of the levator ani and the anal fascia, laterally by the tuberosity of the ischium, and above that by the obturator fascia covering the obturator-internus muscle. These areas are filled with loose connective tissue in which is a large amount of fatty tissue, but with no structures of importance except some blood-vessels. Behind the rectum the fossae are separated only by the fascia attachments of the rectum to the sacrum. The obturator fascia forming the lateral wall is a reflection from the anal fascia, and consequently abscess formations in the ischiorectal fossa are prevented from burrowing above the pelvic diaphragm. It is these areas loosely filled that allow of the excessive distention of the vagina in childbirth and of the rectum in normal function.

## MECHANICS OF THE RELAXED OUTLET

**F**ROM the nature of its structure, the pelvic diaphragm, composed as it is of the levator ani and the rectovesical and anal fasciae, is essentially of an elastic character. In the normal individual it is practically a perfect shelf, for the canals that pass through it run at an acute angle to its plane, much as does the inguinal canal in the abdominal wall. It is designed, aided by the reinforcing support of the pelvic floor, to bear its share of the weight of the abdominal contents and to overcome through its elasticity the various strains.

The pelvic floor aids the diaphragm as a weight-carrier, but has a more specialized function of maintaining the relation of the various outlets to one another and to the pelvic walls. The muscle elements in its structure control the functions of each orifice.

The blending of the diaphragm with the floor gives the former more points of anchorage, since the tension and firmness of the triangular ligaments prevent any lateral motion.

The pelvic diaphragm, being similar in structure, has the same function as the abdominal wall. Through its contraction, it has the same power of supporting the pelvic contents in cases of strain coming from above and caused by forcible contraction of the thoracic diaphragm, either under exertion or the involuntary action of sneezing or coughing. Besides the diaphragmatic action of the levator ani, this muscle has, as its name signifies, a direct function to perform in connection with the rectum. The same levator function applies to the vagina in a lesser degree through the power of the fibers placed between the vagina and rectum and the attachment to the sides of the vagina and the urethra.

In extensive injuries of the perineum, meaning thereby injury not only to the floor, but also to the diaphragm, and commonly spoken of as a relaxed vaginal outlet, a serious modification of the normal relations of the structures takes place. This abnormal relation may not result immediately upon the production of the injury,

for the scar tissue formed in the attempt to repair will, through its contraction, delay the relaxation. The resulting but temporary support obtained is only of short duration, since scar tissue, or even fascia, will not stand any continued strain without stretching, and because the important muscles have contracted and pulled back with them certain of the fascia layers to which they are intimately attached. The length of useful support from nature's handicapped method of repair depends altogether on the amount of strain applied and the degree of injury. The effects are always progressive, and never in an injured perineum does the destructive process stand still.

The ventral rectal wall has lost its support through the injury of the levator ani and its fasciae. The destruction of the central perineal tendon allows the retraction of the external sphincter of the anus, with a consequent increase of the distance from the vestibule to the rectum. Thus the expulsive force of the rectum acts in a ventral instead of a dorsal direction, and this continued expulsive pressure combined with the weight of the bowel contents stretches the rectovaginal septum, forming a rectocele. The walls of the rectocele thicken through unaccustomed exposure to friction, and thus more weight is added. The more this vaginal septum protudes, the less muscular tone the rectum possesses, since the muscle layers become atrophic through excessive stretching, and thus permit of further fascia stretching.

The same process goes on with the bladder in relation to the ventral vaginal wall, though more slowly at first, because of the close attachment of the bladder to the uterus and the firm attachment of the urethra to the pubic arch. The ventral vaginal wall depends most largely for its vital support on the integrity of the dorsal structures, and even though only slightly injured, will quickly show the effect of the perineal defect.

The cystocele and rectocele have been spoken of as hernias of the bladder and rectum, but in the majority of cases they are in reality hernias of the ventral and dorsal vaginal septa. In some cases of forceps delivery the fasciae split, and then a true hernia of the rectum and bladder may occur, and in these cases the increase in the size of the protrusion is rapid. On examination one can palpate

a definite hernia ring of fascia. In ordinary cystocele and rectocele, however, the fasciae are only overstretched and atrophic, and if rest be given by putting the patient to bed or by placing a pessary to support the cervix, the recuperation and gain in tone is surprising, though, of course, evanescent.

The cystocele formation is at first slow, on account of the fairly firm attachments of the ventral vaginal wall and the urethra to the sides and under surface of the pubic arch, and the support of the sides of the vagina and urethra by the levator ani. Soon, however, due to the hydrostatic power of its contents, the development of the protrusion is more rapid. On account of the continued pressure of urine stretching out the vaginal septa, any marked improvement is impossible, and in time the difficulty of operative repair is greatly exaggerated. A slight improvement results from the continued recumbent posture, with its avoidance of friction, and thus the lessening of congestion. This improvement is slight, on account of the weight of urine that is always present. If a pessary is applicable, it can accomplish more, on account of the splintlike support from its rigidity.

If the uterus were a fixed organ, probably the injurious effects might end with the production of the cystocele and rectocele, for the uterus under normal conditions lies in a horizontal position, and any pressure on its upper surface would tend to force it on the bladder in a more antverted position. There, on account of the relation of the pelvic and abdominal cavities to each other and the rather firm fixation of the cervix at its normal level, it is thrown parallel with the plane of the pelvic diaphragm and acts as a valve, closing the rent in that structure as well as pressing together the vaginal walls. The uterus, however, is not a fixed organ, for provision has to be made for the variation in size of the bladder and rectum in daily life and the enlargement of the uterus itself in pregnancy. To be a fixed organ, it must have suspensory ligaments. It has ligaments, but excepting the sacrouterine they are not suspensory ligaments. Even the sacrouterine are not true suspensory ligaments, though they approach nearest to that function. If all the pelvic and abdominal structures are in normal condition, the uterus stays in place practically without the aid of the

ligaments, and only when the distention of the bladder and rectum occurs do we find the ligaments placed under any tension.

The intact perineum keeps the abdominal and pelvic cavities closed. Thus, under balanced opposing forces and in the resulting closed chamber, the uterus practically floats with even pressure on all sides except what may be exerted by the variation in cavity contents and respiration.

Any injury to the levator ani and its inclosing fasciae that destroys the function of the diaphragm permits the entrance of air within the vagina, and thus this uterine balance is immediately disturbed and the structures supporting the cervix are compelled to bear the strain intended for the diaphragm. These structures, while firm enough to be most important in maintaining the position of the uterus under normal conditions, are only of fascia composition and are bound to stretch. Combined with the injury to the relaxed vaginal outlet, more or less relaxation occurs at this plane, so that the cervix sinks somewhat, and as it does the body becomes more perpendicular. This position, known as the first degree of retroversion, compels the fundus to bear the brunt of the now most active force, designated as intra-abdominal pressure, and, with the uterus sinking lower in the pelvis, the uterine ligaments begin to act as suspensory. The circulation is interfered with, the body becomes heavy and congested and flexes on the cervix, giving a retroflexion. Now, the uterus has no tendency to return to the normal position by itself, for all the pressure from above is on the caudal surface and the pressure of the bowel contents makes a valve of the fundus. For a time the uterus remains stationary at the same level, except as it varies within minor limits with the changes in pressure in the abdomen from respiration and straining and the weight of the bowel contents, for the ligaments are suspensory, and only as they stretch does prolapse occur.

When we consider the strength of the cervical supports and the comparative infrequency of severe degrees of prolapse in premenopause life, it is hardly justifiable to consider prolapse wholly as a sequence of retrodisplacement. From the nature of the mechanics, a retrodisplacement is bound to be a forerunner of procidentiae, but prolapse as a sequel is not of sufficient frequency to retrover-

sion to wholly account for its production. In young women, when prolapse occurs, it comes on after precipitous, severe, prolonged, or instrumental deliveries. Its onset is usually rapid, so it seems more rational to explain the condition by acknowledging extensive injuries to the ligaments and attachments of the cervix and upper vagina than wholly by the conditions producing retrodisplacements. In women beyond the menopause, complete prolapse frequently occurs suddenly, and this is due to the rapid giving way of the same structures grown atrophic with age and continued strain. Prolapse operations, then, which will take into consideration the strengthening of the tissues at the cervical level as well as the associated relaxed vaginal outlet, will be the most successful, and failures may be due to overlooking these factors.

The uterus, having sunken to the point where the upper supports are on tension, remains there just as long as these supports can resist the pull from below and the pressure from above. While the pressure downward is practically a non-increasing force within certain limits, the pull from below increases, as has been shown, by the increased weight of thickened mucous membranes and the increase of the residual capacity of the bladder and rectum. This unaccustomed pull of the rectocele and cystocele on the already enlarged and softened cervix results in a gradual stretching out and further hypertrophy of that organ. The greater the friction exerted by the vaginal walls on the displaced cervix, the greater this hypertrophy, so that in some severe forms of cervical elongation, in which the cervix reaches the vulva or protrudes from the vaginal canal, the elongated and hypertrophied organ may be four and five times the normal width. The size of the hypertrophied cervix in this class of cases may be even longer than twice the length of the uterine body. The cases of excessive elongation of the cervix in which the uterine body remains in practically normal position are still another reason for assuming injuries at the cervical attachments as the controlling cause for uterine procidentia.

The cases of elongated cervix are not as a rule associated with as severe grades of rectocele, for the cervix by its splintlike support to the dorsal vaginal wall takes much of the brunt of the pressure of the fecal contents, and as the fasciae gain strength by

support the muscle elements in both the walls of the vagina and the rectum also develop through the relative shortening between their attachment points. In cases of uterine prolapse we also find the comparatively smaller rectocele through this same support by the uterine body. What is true of the rectocele is not true of the cystocele, for, with the stretching of the cervix, the bladder, through its attachment thereto, is also stretched out; and correspondingly, in cases of elongation of the cervix or uterine prolapse, the cystocele becomes a most prominent protrusion.

In this discussion of uterine pathology that is secondary to the relaxed vaginal outlet, we have referred to the force that acts from above in helping to produce the abnormalities. Casual consideration might result in the conclusion that gravity was the greatest factor involved, and that in time it could produce the hernia of the pelvic contents. In reality, gravity directly plays only a moderate part, for when the patient is erect the center of gravity of the abdomen, on account of the relation of the abdominal to the pelvic cavities, falls well out of line of the true pelvis, directly upon the bony walls and the lower abdominal muscle wall. The direct force of gravity becomes indirect in the pelvis and is decreased by the friction of the abdominal contents against the lower abdominal wall, especially in women with enteroptosis.

The force from above that exerts the greatest power is in reality a combination of forces, and for convenience has been designated intra-abdominal pressure. The question of what intra-abdominal pressure really is, in fact the existence of such a factor at all, has occupied the attention of many, and vain attempts have been made to get some measure of its power.

Gravity plays a most important part, but directly counteracting that force is a factor that was very frequently discussed by the older writers, and designated by them the "retentive power" of the abdomen. This "retentive power" of the abdomen is practically the condition so frequently found in attempting to deliver a pelvic tumor situated low in the pelvis and in close relation to its walls. Not until we can admit air beneath the mass does the growth come up easily. This condition, of course, is due to the lack of dead spaces within the abdomen, and is nothing more than the effect of

air pressure. The more or less elastic character of the abdominal contents and the containing abdominal muscle makes more effective the relative vacuum and prevents the displacement of the abdominal contents.

In a normal closed abdomen, the pelvic cavity also included, the pressure on any one point of the internal wall must be a component of at least three factors. The first of these factors is the weight and pressure of the contents of the hollow structures, these contents being either solid, liquid, or gaseous, or a combination, according to the nature of the function of the organ. But this internal force is held in restraint and somewhat counteracted by the second force, the contractile power of the muscle and elastic fibers composing the containing walls, aided by the ligamentary supports of the various organs. If the contents of an organ are solid or liquid, gravity alone is involved in the production of excessive distention. But in those organs where fermentation may give rise to gas formation the laws of gas pressure and expansion come into play. Over these two forces the individual has no voluntary control. The third force, on the other hand, is almost wholly a voluntary one and exerted through the contractile power of the thoracic and pelvic diaphragms and the containing lateral muscle walls. The abdominal walls and the thoracic diaphragm act largely in conjunction, whereas the pelvic diaphragm is more of an antagonist, and in its contraction bears the strain of the force applied by the thoracic diaphragm in normal respiration or involuntary actions, as in hic-coughing, vomiting, etc.

It is the component of these three forces, then, that determines the character and degree of any internal abdominal pressure, and these forces can in many ways be modified; for instance, excessive pressure of the internal contents of an organ will cause a relative paralysis of that organ's muscle fibers and prevent emptying, thus doing away with the controlling second force and allowing great increase of the first. A poison acting on the sympathetic nervous system may also result in a paralysis of the muscle fibers producing the same results. Peritoneal inflammation or irritation by direct action may also produce paralysis. In a normal abdomen gravity is largely a potential and not so much an active force. It

is exerted actively within the cavity upon the solid contents of the containing organs, and upon an organ itself that has lost its support, such as we find with a movable kidney; but upon the contents of the abdomen as a whole it is practically non-active, being distributed evenly upon the intact containing walls.

Under normal conditions these forces are practically balanced and concern us little, but when a break occurs in either the abdominal wall or pelvic diaphragm this balance is disturbed, and the normal forces, meaning thereby gravity, gas distention, and pressure from forcible contraction of the diaphragm and abdominal walls, produce serious conditions where the defect is not remedied. These normal balanced forces can hardly be designated by a specific name, but when the balance is disturbed we are justified in defining the abnormal relation of pressure by some specific term, and it is to this abnormal relation that the name "intra-abdominal" pressure applies. "Intra-abdominal" pressure, then, is the component of the three forces found in the normal closed abdomen, with an increase in the force of gravity the lower the artificial opening in the retaining walls, but again restrained somewhat and in the same increasing ratio by the so-called "retentive power" of the abdomen, or, in other words, air pressure. When it comes to the pelvic diaphragm, the gravity of the abdominal viscera is lessened, as has been explained, by the change of direction of the force and by friction, but the weight of the bladder and rectum contents is added.

In the case of each individual organ having suspensory ligaments the sum total of gravity does not vary, but, on account of the upper points of attachment, the place upon which it acts with a static force will be modified.

Now, while as a rule an abdominal hernia unrestrained will increase in size more rapidly than the pelvic hernia, this is not wholly due, as might be supposed, to the greater force of gravity exerted on the lower abdomen over the pelvis, on account of the body construction. In the pelvis are the cervical and uterine supports bearing the strain, and only as they stretch does the greater degree of procidentia develop. Consequently, the development of the end conditions of the relaxed vaginal outlet is of insidious onset, but always progressive, and the rapidity of the progression depends on

so many factors in the life of the individual woman that a prognosis of the time required is impossible. What may occur rapidly in a hard-working individual may take years in one of sedentary habits, though in each case the primary pathology may have seemed to be identical.

But neither is it alone the individual's activities that hasten the process, for other factors concerning the resistance of fasciae and scar tissues have to be considered. The woman's correctness of carriage, the proper application of corsets, the care during subsequent pregnancies, and the control of all those other conditions favoring pelvic congestion have a very significant bearing on the final outcome. While prophylaxis in all those things which favor pelvic congestion has its influence on the final outcome, yet the process goes on progressively until the repair of the pelvic diaphragm and outlet is accomplished.

## ETIOLOGY AND PREVENTION OF LACERATIONS

**T**O THE question of etiology and prevention of childbirth injuries very little attention is paid in the obstetrical textbook outside of the consideration of the perineum and the means recommended to prevent injuries there. The methods advised are pretty well stereotyped, and practically all discussions consider the technique of the most normal presentation, the abnormal cases being acknowledged to result almost invariably in injury. On the prevention of cervical tears little is said.

Regarding the prevention of perineal injuries we have different methods advocated. Varnier teaches that it is the child's forehead that is liable to cause injury. He recommends holding back the forehead so as to prevent extension until the parietal eminences and neck are delivered under the pubic arch, and then allowing the slow appearance of the forehead, nose, mouth, and chin successively, and that preferably in the interim between pains; this he accomplishes by pushing back the vulvar parts, and, if possible, is aided by the voluntary expulsion on the mother's part. He thus acknowledges that it is the rapid expulsion of the head which causes the greatest danger. If delivery is accomplished as he advises, he states that there is no fear of perineal tear. Such may be true if the relation of child to mother is not abnormal as regards size.

Hartmann advocates Varnier's method and rather belittles the frequently recommended supporting of the dilating perineum by the obstetrician's hand, "for the perineum will tear under the hand supporting it."

Peterson says: "In spite of the greatest care, lacerations will occur in certain cases, but if the obstetrician is skillful, the tear will be of minimum size. There is seldom any excuse for the extensive rupture upon which the gynecologist operates later."

The fact remains that the more skillful the obstetrician the less severe the injury, but that there is no excuse for the extensive

relaxations found later is not true. From the hands of the best obstetricians often come some of these same extensive relaxations, and the reason for this has been shown in the chapter on the results of perineal injury. All such injuries are progressive, and many results seemingly good shortly after labor lead to a marked degree of relaxation as the scars stretch and muscles atrophy. The injuries which are the result of the giving way of the muscles and fascia beneath the uninjured mucous membrane also take time to develop.

The use of the rubber water-filled bag has been recommended by Macomber as a method of dilating not only the cervix, but also the perineum, and thus avoiding excessive injury. He advises placing the largest bag possible, preferably of the Voorhees type, within the vagina during the first stage of labor. He claims that thus the transmission of pressure from the uterine contraction helps the perineal softening, and the presence of the bag with its weight upon the outlet stimulates the uterine pains. After the first stage is over, the descent of the child pushes the bag ahead, giving a more gradual and even dilatation than would be accomplished by the vertex, and the bag's presence still acts as a stimulator of uterine contractions.

In the opinion of some obstetricians, it is held that the degree of injury can be more readily controlled with the patient in the lateral posture rather than the dorsal. In the lateral position it is easy to demonstrate that the tear begins within the vagina, and that in most cases the diaphragm gives way beneath the superficial structures, an occurrence it is impossible to prevent.

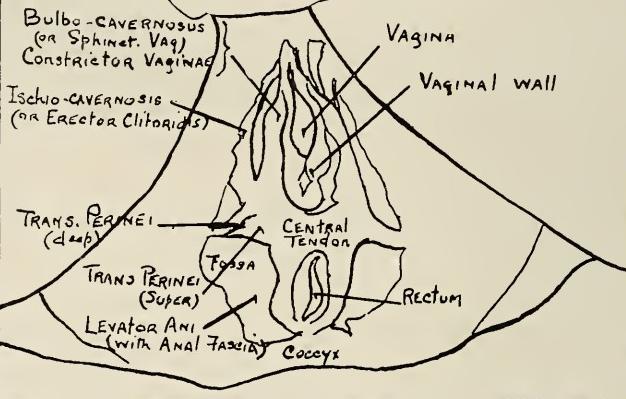
Another method advocated for the prevention of injuries is the incision of the vulva, or episiotomy. According to Berkeley and Bonney, "In exceptional instances, when it appears certain that the head cannot be born naturally without a severe rupture of the perineum, deliberate incision of the latter should be performed. The division should not be made in the middle line but to one side of it. Bilateral incision is preferred by some authorities."

Hartmann, already quoted, says: "The little incisions in the vulva are useless and only lead to tears. If the central tear is feared, make an oblique incision backward and outward; a median section

PLATE VIII

THE MUSCLES OF THE VAGINAL OUTLET DISSECTED TO  
SHOW THEIR RELATION TO THE VAGINAL OUTLET,  
WITH REFERENCE TO EPISIOTOMY INCISIONS

LAYERS TRIANGULAR LIGAMENT REMOVED (LEAVING Muscles  
(IN ORDER TO SHOW PROPORTION OF MUSCLE TISSUE)



On the left side the superficial muscles with the superficial layer of the triangular ligament have been removed. The well-developed deeper muscles are shown running into the central tendon. On the right side the superficial muscles are still present and dissected from the deeper layer only in the ventral portion at the pubie arch. The sphincter ani is separated from its sheath and is shown in its attachment to the central tendon and the coccyx. The anal fascia is exposed over the dorsal portion of the levator ani.





increased by the passage of the fetal head risks the rupture of the muscular tissue of the anus."

Peterson sums up the question of episiotomy as follows: "1. Many cases in which a tear of the perineum seems imminent escape without any lesion whatever if the obstetrician takes time and pains in the management of the delivery of the head. 2. There are two incisions, while a tear in the perineum may be single. 3. A tear in the perineum, if properly sutured, unites as well as the wounds in episiotomy. Ruptures of the perineum may involve the levator-ani muscle or anal sphincter and are in a location more difficult to keep clean than the posterolateral wounds which involve no important structure. Episiotomy seems justifiable only when the operation is certain to substitute two slight wounds for a serious perineal laceration; the less experienced the obstetrician the more likely is he to perform episiotomy."

What does episiotomy as ordinarily advised accomplish, and does it by any chance prevent the injury of the deeper structures or direct the injury in the desired direction?

The operation is done when the head is beginning to distend the vaginal outlet excessively. Surrounding the protruding head then are the vaginal-sphincter muscles, with the inner edge of the triangular ligaments markedly on stretch. The elastic central tendon to which these structures as well as the transversus perinei and sphincter ani are attached is stretching across the bregma, which is putting excessive strain on these muscle attachments and the inclosing fasciae. It is practically impossible to determine the amount of room required, and there is no way to check the tear once started in the incision lines or to control its direction.

The majority of the episiotomy incisions probably sever only the stretched-out labia minora or fourchette, and possibly the edge of the fascia shelf, for it has been estimated that the skin and mucous membrane, when the perineum is in full extension, extend two to three centimeters beyond the muscle. When one realizes from dissections how comparatively deep the vaginal sphincters are placed beneath the labia, it is easy to see that the average incision would not involve that muscle. If the incision is only deep enough to cut through the superficial structures and Colles's fascia, its location

is of little importance, provided that location does not involve the portion of the mucous membrane overlying the orifice of the gland of Bartholin, which, if involved in the resulting scar, might favor a cyst development.

To be sure of saving the portion of the perineum most important, such incisions must be carried through the pelvic floor, for a tear that is not going to involve that structure should need no episiotomy.

If the incisions are placed laterally in no matter what radial direction and deep enough to accomplish the desired purpose, they are bound to cut across some portion of the muscle sling around the vagina. The more downward and outward they are from the horizontal line, the less of the total width of this muscle sling they separate on account of the radiation at the central tendon attachment, but the greater the chance of separating the transversus-perinei attachments.

With the severance of these muscles, the fibers immediately retract, for they are not sufficiently attached to the fascia layers to be held thereby.

The incision is probably repaired by uniting the fasciae and the mucous membrane, the retracted muscle being overlooked. The chances are that, lacking the support of the floor, the portion of the pelvic diaphragm between the vagina and the rectum has given way, but exposes no injury superficially.

The lateral attachment of the levator ani to the sides of the vagina pulls forward the segment ventral to the incision; the contraction of the sphincter ani, the dorsal portion. The consequence is that immediately following the closure of the incisions where the muscles have been ununited the results look good, but all the factors are present for the later development of a relaxed outlet.

If it seems wise to guide the injury that it is impossible to prevent, I prefer to incise the apex of the stretched-out fourchette through the central tendon as far as it appears necessary. If the injury promises to be so excessive as to involve the sphincter, it is possible to direct the cut to one side or the other, though such procedure is almost out of the possibility of requirement, as careful delivery will save the sphincter almost invariably. Injury of the

sphincter is almost without question the result of too hasty delivery, though there are occasionally subjects where the tissues seem to melt away under practically no strain.

I prefer this median incision, knowing that, with the method of repair advised, it is possible in the majority of cases to get good results. With a direct median incision there is no danger of individual muscle retraction, for at this point the fasciae and muscles are intimately associated. It is also easy to follow up the extension of the injury if it has gone beyond the range of the incision. There is then also no unsuspected submucons tear overlooked, and, moreover, it is possible to adjust the size of the incision to the size of the head.

In cases in which the diaphragm has given way beneath the uninjured mucous membrane, and even beneath the central tendon, some authorities advise cutting through the bridge of tissue so as to be able to approximate the retracted structures.

If, according to Hartmann, "in spite of all prevention the perineum is torn, the rupture is lateral always, the posterior column of the vagina, fibrous and resistant, remaining intact. The vagina, skin and vulvar constrictor being torn through, on separating them, we get a lozenge-shaped wound which left to itself to cicatrize results in a perineum which no longer plays its role as a supporting agent."

It is true that in the majority of injuries the tear is lateral, not, however, because of the resistant dorsal vaginal wall.

The greater number of tears are unilateral, with probably a larger per cent on the left, but whether this is due to the preponder-



This patient has been twice confined. In neither case was there any tearing of the mucous membrane. The degree of relaxation is very marked, but on the ventral wall the rugae are still prominent. If a patient is confined in the lateral posture, such an injury to the levator ani may be more readily observed during its occurrence.

ance of left presentations, as claimed by some writers, is questionable. It is probably true that some of the tears are caused by the delivery of the shoulders rather than the head; or, at least, we can perhaps more safely say the shoulder delivery increases the degree of injury, for it is impossible to determine the extent of the tear resulting from the birth of the head, especially where the central tendon has not been excessively injured. The injuries produced by the



A relaxed vaginal outlet in which the central tendon and median raphae have not been injured. The injury to the levator ani has permitted the development of a rectocele. This patient had had an abdominal operation to correct a retrodisplacement, but with no improvement to her symptoms. A perineorrhaphy cleared up the physical condition.

and this is accounted for by the anatomical relations. A combination tear involving both the floor and diaphragm is a "Y"-shaped injury if both sides of the vagina are involved, though only one arm of the "Y" is present when the injury is not bilateral. We must bear in mind that if the diaphragm is injured, no matter in what direction the mucous-membrane tear occurs, we can demonstrate the defect by careful palpation. The very presence of a lateral tear running from inside the central tendon indicates a ruptured pelvic diaphragm.

shoulders are more often than not due to the greater haste of the obstetrician in their delivery or are a result of the method used to extract the arm. If the central tendon only is involved, and the structures are of equal strength on either side, the tear is always in the median line, for that is the point at the apex, as it were, where the greatest tension comes. If the central tendon is not involved, but tearing of the pelvic diaphragm occurs, it is always situated laterally.

Tears of the vaginal mucous membrane may occur in any direction if the stretching is too severe, but the tear in the diaphragm always runs to the side in the plane of the levator ani,

Upon the relation of the segments of the levator ani to each other and upon their attachments in the median line depends the course of injury to the pelvic diaphragm. The ventral segment of the muscle, by its firm attachment to the sides of the vagina and its fascia layers attached under the pubic arch, together with the firm triangular ligaments, prevents any chance for much freedom of play, and practically fixes the ventral and side walls of the vagina. When the excessive dilatation comes, the pressure is consequently exerted most markedly in stretching out the parts dorsal to these structures. The dorsal edge of the triangular ligament, which has been called the "ischioperineal" ligament, for all practical purposes may be considered as defining the fixed portion of the pelvic diaphragm from the more readily distensible portion dorsally.

The pressure of the child as it comes from the hollow of the sacrum under the pubic arch is directed against the dorsal two-thirds of the pelvic diaphragm. The portion behind the rectum, on account of its protection by the two firm fascia layers and the elasticity of the rectum itself, bears the strain best, and is also well protected from sudden force by the central portion of the muscle with its fascia reflections situated between the vagina and the rectum. Naturally, this portion between the vagina and the rectum, which is practically a separate segment, is the one first to give way to dilating forces. Having given way, it is on account of the firm fixation of the vaginal canal ventrally and laterally and the greater elasticity of the dorsal segment that the tear extends up the vagina in the plane paralleling the segment division. This same injury can happen without any superficial tearing in cases where the distensibility of the vaginal canal is possible on account of well-defined rugae. As a rule, in such subcutaneous ruptures, the central tendon is elastic enough to stretch without tearing. Thus, the most careful palpation is necessary to define such an injury, as superficially there is no evidence.

Lacerations of the cervix are even more frequent than perineal injuries. Some men write of physiological lacerations of the cervix, thus acknowledging the fact that in practically every case we get some degree of injury. Many are shallow enough to involve the mucous membrane only, and these naturally are of little pathological

consequence. What concerns us in the later plastic work is the tear that is deep enough to injure the circular muscle fibers, and which in the process of healing gives the round-cell infiltration and later the scar-tissue formation in the angle of the wound.

It is true that we may prevent the formation of extensive injury by avoiding the too early application of forceps or too strenuous forcible dilatation.

The more severe cervical injuries probably occur from forceps deliveries, and especially in those cases where the undilated ring is carried down with the head, pinching the ventral lip between the head and the pubes. It is probably true, too, that the shoulders may produce injuries or increase those already produced by the head where extraction is too rapid.



Lacerated cervix. The greater injury is on the left side, extending as high as the internal os. This patient miscarried twice before operation, but since then has been confined at term.

too slack to approximate the torn edges, and, finally, the fact that the majority of tears heal kindly without intervention, give us the authority for this stand. However, a large number of cervical tears do not thus heal by first intention, and the formation of scar tissue, with or without the turning out of the cervical mucous membrane, gives rise to the secondary symptoms. There can be no doubt that many miscarriages are due to the persisting deep clefts in the cervical tissue, even when not associated with endocervicitis, which alone is enough to prevent pregnancy or favor miscarriage.

The text-book advice is to leave cervical injuries alone unless the need of controlling hemorrhage arises. The difficulty of the work, the increased risk of infection, the rapid involution of the tissues in the first days, which tends to leave the stitches

The usual treatment of the parturient woman has kept her firmly bandaged and lying on her back. During the first twenty-four hours after confinement, a snugly fitting binder with a firm pad, so placed as to keep the fundus against the pubes, favors the contraction of the uterus and the prevention of hemorrhage. After the danger of relaxation has passed, anything but a loose binder is not only useless, but may be injurious. A firm binder has little or no value in favoring the popular desire for "shape"—a muscle done up in a splint gains nothing in strength, but judicious use of the abdominal muscles is what brings back tone to the stretched anterior wall. A firm binder does harm by forcing the uterus into the pelvis and thus stretching the lower uterine supports; or, if the supports are resistant, it tends to evert the injured cervical lips and prevent primary union. It seems reasonable to lay the persistence of many a cervical injury to pressure thus applied, and the same applies in a lesser degree to the perineum.

The injurious effects do not stop here, however, for the pressure combined with too prolonged dorsal decubitus favors the sinking of the uterus in the pelvis, and thus its later retrodisplacement, with a permanent elongation of the ligaments.

In a case complicated by separation of the recti muscles, support of the abdominal wall is necessary, but not to the point of producing pressure sufficient to result unfavorably to the cervix and uterus.

## PATHOLOGY OF THE CERVIX

THE pathological conditions of the cervix from the standpoint of etiology may be classified under two heads—the conditions resulting from infections, and those that are mechanical. The malignant growths are processes superimposed on the induced pathology that results from one of these etiological factors, most frequently the mechanical.

The mechanical factors are by far the more numerous, including not only the direct conditions resulting from injuries of childbirth and instrumental dilatation, but the indirect ones, such as cervical inflammation and hypertrophy secondary to the relaxed vaginal outlet.

Cervical infections are not common, and are chiefly due to the venereal factors of gonorrhea, syphilis, and chancroid.

Practically, the only acute cervical inflammation of moment clinically is the gonorrhreal, unless the inflammation has been the result of germ inoculation by instrumentation, in which case the inflammation is not confined to the cervix. Consideration of inflammations having their origin above the cervix, even if associated with marked cervical inflammation, is out of place here.

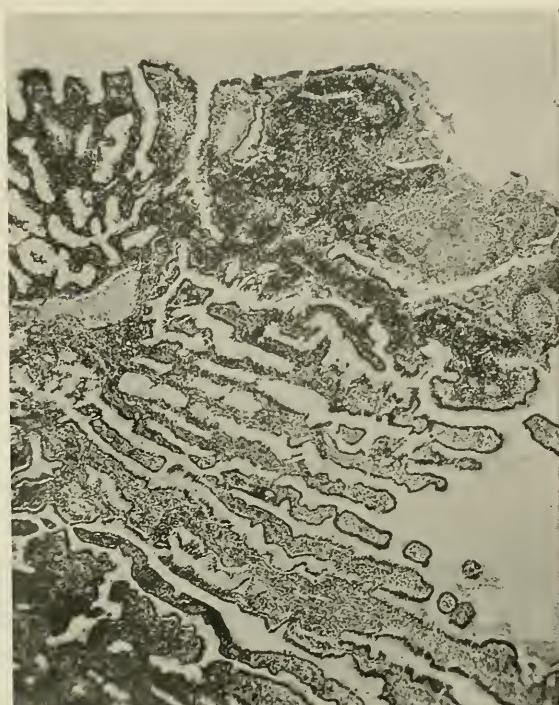
Acute gonorrhea may localize itself in the cervix without extending higher, and it is then evidenced by a soft, congested cervix with swollen, puffed-out mucous membrane, covered by yellow, often greenish, discharge, and often with spots of erosion on the surface. With this, as a rule, is associated a congested vagina, a urethral discharge, and the "gonorrhreal maculae," as the reddened orifices of the ducts of the glands of Bartholin have been called—so called because that appearance is practically always associated with gonorrhea, on account of the susceptibility of the glands to that infection. It must be remembered, however, that one is not justified in making a diagnosis of gonorrhea from that finding alone, since other infections, and occasionally a hyperfunction, will cause a reddened orifice. The microscope will confirm the diagnosis, although

if the condition has become less acute it may be difficult to find the diplococcus of Neisser. The presence of many pus cells in the discharge when no germs are demonstrable is always a finding suspicious of gonorrhreal infection.

In the chronic infections of the cervix (aside from tuberculosis and syphilis) the gonococcus plays an important part, the germs frequently remaining in the depths of the glands ready to be stirred up by any mechanical interference, as is the case with Littre's follicles in the urethra or with the glands of Bartholin in the vulva. The enlarged, congested cervix, the increased glandular secretion, and possibly some cystic glands are practically the only important signs.

Another chronic infection that has all the physical signs of an acute process, yet is always of chronic duration and with few acute symptoms, is caused by the diphtheroid bacillus.

This infection, involving the cervix alone, but more frequently extending over the whole vagina, is usually found in young unmarried women. The mucous membranes have all the appearance of an acute inflammation, and are covered with a creamy, yellowish discharge. The diphtheroid bacillus can be grown usually in pure culture, not only from the discharge, but from the urine. From the



Section of tissue removed by the curette from the cervix for diagnosis. The glandular proliferation present is characteristic of any inflammatory process. In the upper right-hand portion of the illustration is an area showing marked round-cell infiltration surrounding an area of cell necrosis. Bordering the necrotic area are a number of giant cells. These are the elements that are diagnostic of a tuberculous process—a condition not often found in the cervix as a primary involvement.

fiery appearance of the mucous membranes one could readily suppose a streptococci infection, and the comparative lack of all symptoms beyond the discharge makes an unusual combination.

Rosenow's theory of germ convertibility, in which the type and virulence are controlled by the location of the primary focus, would possibly place this diphtheroid bacillus as a modified streptococcus.

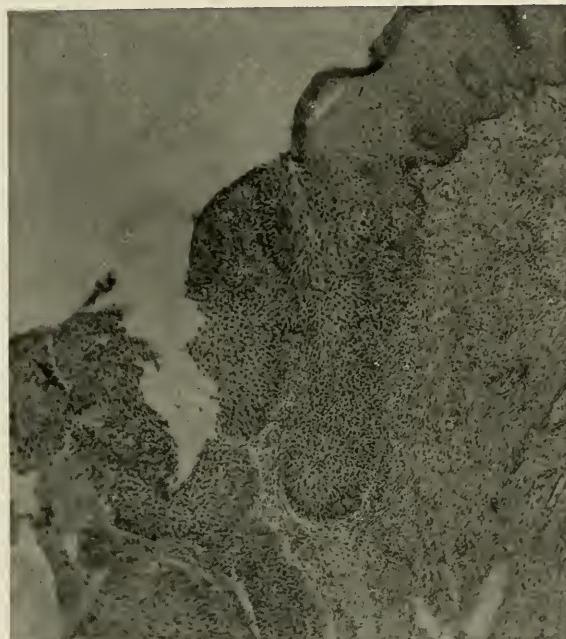


This higher magnification of the preceding slide is taken at the edge of one of the tubercles. In the upper corner is the beginning of the necrotic area; in the center of the illustration the layer of typical giant cells, and below these the round-cell infiltration; thus showing the characteristic formation of a tuberculous process. The giant cells with their nuclei arranged around the periphery more or less in the shape of a horseshoe are typical of tuberculosis. Surrounding these are the distinct connective-tissue proliferations opposite the area of necrosed young mesoblastic cells—findings also characteristic of the same disease.

The most characteristic features of the process are the severity of the signs, the absence of acute symptoms, and the marked resistance to the usual methods of cervical and vaginal treatment. The most prompt improvement has come from the use of the basic fuchsin 1-1000 as an application, yeast tampons, and vaccines.

Primary tuberculosis of the genital tract is rare, and most ob-

servers consider that the greater percentage of cases of cervical tuberculosis have their origin higher in the tract than the cervix, though others claim that at autopsy the greater frequency of body involvement over cervical is due to the greater ease of diagnosis of the cervical condition and its subsequent removal. It is probably true that some cases of cervical involvement are operated upon when no true diagnosis has been made. It is hardly necessary to consider in this chapter the minutiae of cervical tuberculosis, for the condition has the same characteristics here as elsewhere; but it is necessary to emphasize the fact that primary involvement of the cervix is rare, and that the probability is that the body is also involved. But the body involvement would place the consideration of the condition beyond the scope of this work. Microscopical examination will confirm the diagnosis and emphasize the surgical treatment if its limitation to the pelvis is certain.



An early case of epithelioma of the cervix. The penetration of the squamous cell masses into the stroma, gradually involving the normal covering of the cervix, is typical of a malignant ulcer.

Chancreoidal ulcerations are usually multiple and associated with similar conditions on the vulva. The greater amount of local inflammation, the increased discharge, the more marked sensation, with the lack of general manifestations, distinguish the condition from syphilis. Here, as elsewhere, a positive diagnosis cannot be made on the clinical findings alone. The microscopic demonstration of spirochetes will designate lues, but clinically sixty or ninety days must elapse before one can be positive of a local infection only.

Syphilis often shows itself in the primary as well as the secondary and tertiary stages on and in the cervix. Though the initial lesion is frequently located upon the squamous mucous membrane of the cervix, it is often overlooked because it does not always appear as the classical chancre; in fact, more often we have a localized spot of hypertrophy without the loss of substance of ulceration.

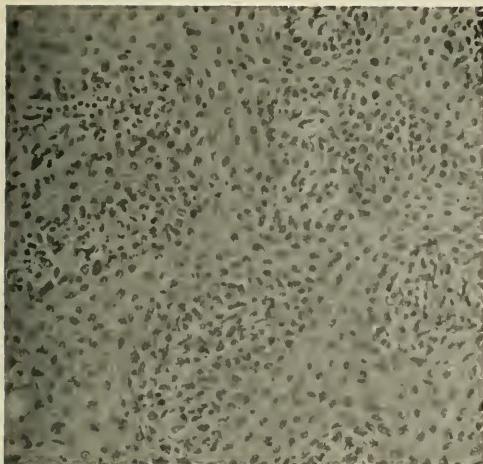
Consequently, the diagnosis of syphilis in the female is and should be made from the secondaries, although a follicular vulvitis, if associated with a suspicious cervix, or even if occurring as an entity, is exceedingly suggestive of specific infection.

In the secondaries, on account of the lack of symptoms, mucous patches on the vaginal walls and on the cervix are probably not detected. Their principal importance would be as a confirmatory sign in diagnosis.



A section from the cervix at the edge of an epitheliomatous ulcer, or so-called "chanroid der portio," removed for diagnosis. The stratified squamous epithelial covering of the cervix is intact in the upper portion, but over the ulcer area has been replaced by masses of characteristic squamous epithelial cells which grow into the stroma in finger-like projections. These epithelioma areas are surrounded by inflammatory infiltration.

The tertiary involvement of the cervix is not infrequently unrecognized, especially as this condition has its expression in a marked hypertrophy with many and often exaggerated cyst formations. Such a possibility must be borne in mind, for the local operative work will not accomplish anything toward a permanent correction, since the condition will rapidly recur if no systemic treatment is inaugurated. The general manifestations at this stage

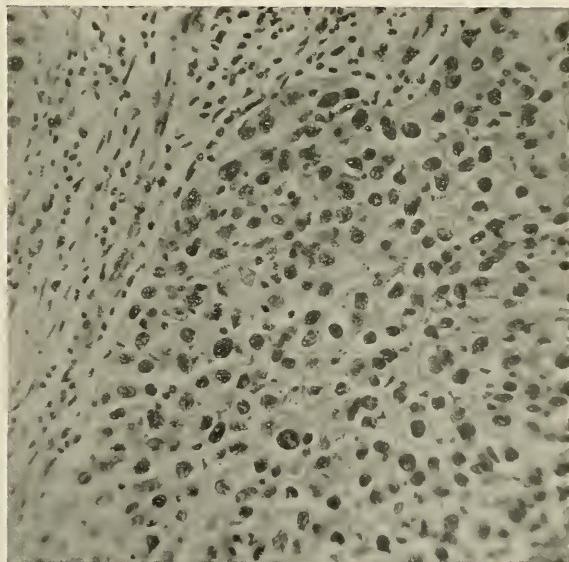


This section of a portion of cervical epithelioma shows the cells arranged in "whirls," the so-called "pearls" of the squamous-cell growth. or mechanical dilatation. More recent observations have shown that the tumor does not begin on the site of the injury with its scar-tissue formation, but on the ventral or dorsal lip, which often shows no defect. The observers argue that the injury, consequently, is not the etiological factor. The clinical findings, however, are not altered, and the history of the preceding injuries is always present.

Rodman, of Philadelphia, recently made the positive statement that lacerations of the cervix should be repaired, for, in his opinion, it has been clearly shown that nearly all cervical carcinomata

are always present and will confirm the diagnosis. Such syphilitic hypertrophy is ordinarily superimposed on a cervix injured at childbirth.

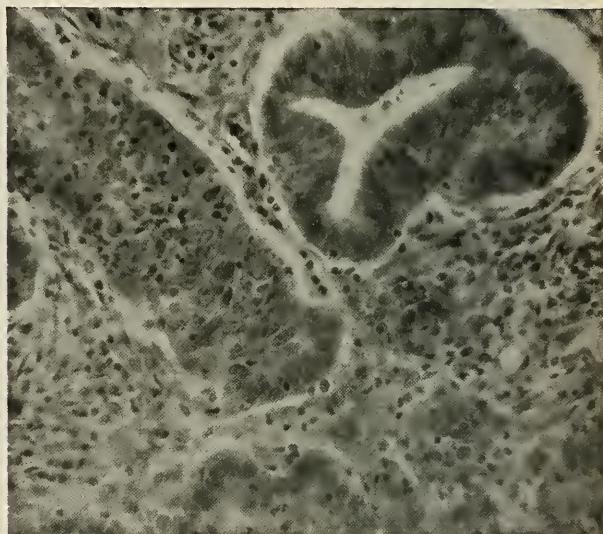
In the cervix two types of cancerous formation occur—the epithelioma and the carcinoma. The epithelioma with its usual microscopical characteristics appears first, of course, on the surface epithelium, and practically always in women who have had injuries from childbirth



A section from a squamous-cell carcinoma of the cervix, of interest mainly because the marked enlargement of the individual cells shows well the extraordinary polymorphous character of cancer cells. Some of the stages of cell division are also represented.

follow lacerations, and that unmarried and unfruitful women, while quite as frequently suffering from corporeal cancer as multiparae, are exempt from the cervical variety.

While not overlooking the possible parasitic origin of cancer, it is clinically evident that cancer formation has its origin always in locations where increased congestion due to irritation is



A more highly magnified section of cancer of the cervix. The two gland sections represented show a piling up of the epithelial cells. The basement membrane is intact, and the epithelial piling is not as irregular as usual. The diagnosis of malignancy is founded upon the metamorphous character of the cells and the complete obstruction of the gland lumen.



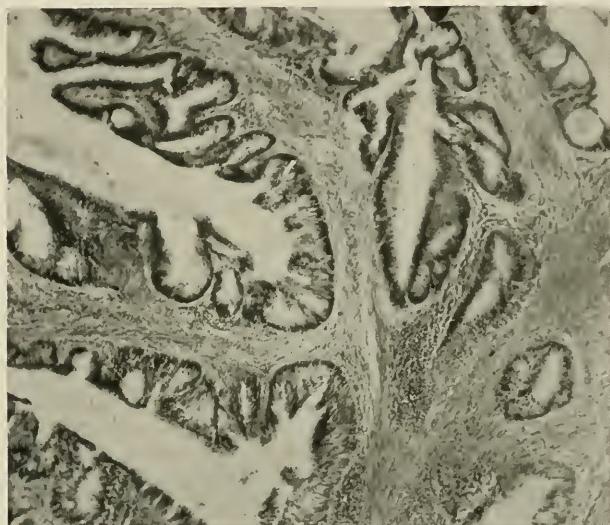
A section showing extensive involvement of the cervix by cancer structure. The normal cervical elements are almost completely replaced.

present. It is Bossi's contention that cancer is solely of histological origin, and in most cases begins in lesions that are benign; and that the irritation is the indirect cause of the malignant formation by producing an increased circulation. The increase is due to the formation of new vessels or the enlargement of the old.

The extra-continuous blood supply, probably by some chemical alteration, stimulates the epithelial cells of glandular structure to overgrowth and abnormal cell division. These epithelial cells become embryonic in character, and, like all embryonic cells, have greater power of reproduction and grow at the expense of the normal elements.

Most pathologists believe that the cancer cell is a "weak cell" and less resistant to destructive agents than the normal tissue elements. For this reason radiotherapy, either with the X-ray, radium, or mesothorium, has the power to injure the cancer cell more rapidly than the normal tissue. The cancer cell thus can be considered as having a greater activity of growth, which is a positive power, but as lacking the negative faculty of resistance, which is a quality of normal tissue.

Theoretically, it would be more natural to expect the malignant growth to have its origin in the ventral or dorsal lip rather than at the site of the tear, for the normal blood supply runs around the cervix from its lateral origin, and the scar-tissue contraction at the angles of the tear would decrease the supply there, but tend to increase it in the normal tissue through interference with the return flow. It would also be more natural to expect the stimulation by the circulation, with the increased growth in the cells that are free from the cicatricial tissue found around the angles of the tears. The much more frequent per-



A section of an adenocarcinoma of the cervix. The more marked stroma, with the proportionally less heaping of the the epithelial cells, indicates a hard, slow-growing tumor. The malignancy is marked by the usual characteristics. Such a growth, while relatively common in the uterine body, is comparatively rare in the cervix.

sistence of the lateral clefts in injuries of the cervix over those in the ventral and dorsal lips tends to make us overlook the fact that injuries do occur and persist as well in the median line of the cervix, and in those cases we should rather expect the degeneration to begin laterally.

The early manifestations of the disease differ little in appearance and character from Nabothian cyst formation, but the greater induration, the solid and less translucent character, the single nodule,

the location in the ventral or dorsal lip, usually at the mucous juncture, tend to aid in the differentiation, and, fortunately, in the microscopical examination lies our method of positive diagnosis. It is in this stage that its recognition is difficult, and that its removal by high amputation, as advised by some men, by actual cautery, or by carbon-dioxide freezing is possible. Later it is only from more extensive procedures, such as hysterectomy, that we can expect a radical cure. In



A highly magnified reproduction of a portion of the preceding section, showing a single gland. The characteristics of malignancy are well shown—the metamorphous character of the cells, the irregular heaping, with the destruction of the basement membrane.

the late stages, when operation is impossible, the only hope lies in the cautery, the X-ray, or the newer applications, such as mesothorium. That the recent excessive enthusiasm over radium in the treatment of malignancy is not well founded is the opinion of men most qualified to pass upon the subject.

In the beginning of the growth the only symptom present may be increased leucorrhæal discharge. By the time blood-streaked mucus and bladder irritation and pain have supervened ulceration has

occurred, and the adjoining structures may have become involved; but, fortunately, even a late-discovered epithelioma is slow in glandular extension, and thus offers greater hope for complete extirpation.

The carcinomatous type having its origin on the surface of the cervical canal mucous membrane, or within the glands them-



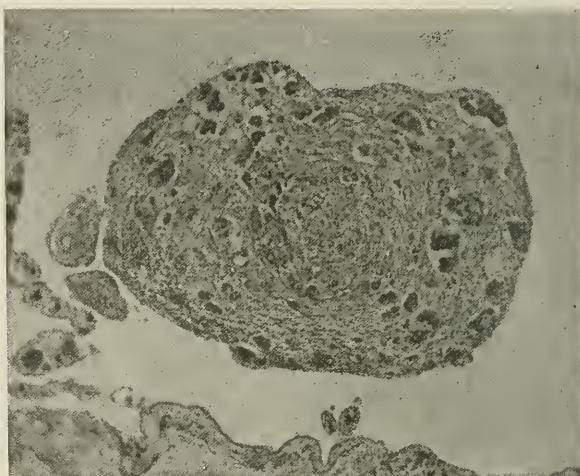
A malignant tumor of the cervix in which the growth has penetrated deeply into the tissues. Some of the finger-like projections are here shown in cross-sections. Not only the squamous cell, but also the cylindrical growths, tend to this arrangement. This section is from glandular carcinoma, judging by the character of the cells and the fact that the masses of cells are growing toward their center.

selves, is more rapid in growth, especially in younger individuals, and, if not accompanied by ulceration, may progress within the canal to serious involvement without producing sufficient symptoms to cause its recognition. It will, on account of its morphology and situation, involve the lymphatics earlier than the epithelioma.

Cervical curettage and microscopical examination aid in the

early recognition, and, if malignancy is proven, should be followed immediately by radical treatment.

Cases have been reported in which the clinical symptoms pointed toward malignancy, while the tissue examination had negative findings; but, as Dr. Rodman, of Philadelphia, in reporting a case of lip ulcer excised as possibly malignant but returned as benign by the pathologists, says, "The patient is happy that he hadn't cancer, and I am not unhappy that it was prevented. Instead of cha-



Metastatic carcinoma of a lymph gland. Characteristic nests of epithelial cells are present throughout the entire gland. This section of a normal-sized lymph gland, about an eighth of an inch in diameter, well illustrates the impossibility of complete gland extirpation in cases of cancer of the uterus. It confirms the present opinion that the extensive gland dissection with its high primary mortality is not justifiable. A carcinoma already beyond the cervix may have many such metastases.

grin, when such reports are received from the laboratory, there is cause for exultation. The more of them the better."

It is the belief of some surgeons that curettage or tissue removal done for examination purposes only hastens the spread of the disease. In no case must we disregard clinical findings for those of the laboratory, since it is impossible for any examination to be exhaustive, and the malignant structure may be overlooked by surgeon or pathologist. It is better to do the radical work if the clin-

ical symptoms are suspicious, even if the pathological report is negative. If positive evidence is obtained, no delay is justified, and the question of extending the infection, if an immediate operation is done, can hardly enter into the discussion.

Fibroids of the cervix are comparatively common. Sarcomas occur, but are rare. Neither condition comes within the scope of our present purpose. These are mentioned only to emphasize the possibilities.

Chorioepithelioma of the cervix or vaginal canal is a possibility, but it always has as its forerunner a complete or an incomplete pregnancy, a perverted pregnancy, such as in hydatid mole, or a teratoma.

When chorioepithelioma occurs in the vagina, it is most often situated on the dorsal wall a little below the point opposite the cervical os. A recent case in my hands presented the appearance of an irregularly punched-out ulcer about one-half inch in diameter, the edges undermined, the base seemingly an attached blood-clot. Profuse bleeding had taken place from the ulcerated area at the time of an abortion of a two-month pregnancy, and had been controlled by the physician in charge only by suture and packing.

Every chronic congestion of the cervix and cervical canal has a mechanical basis for its presence. It may be an injury from child-birth to the cervix itself or to the perineum, and this is the most frequent cause, but in the nulliparae we find other factors. The inflammations of the mucous lining of the uterus have previously

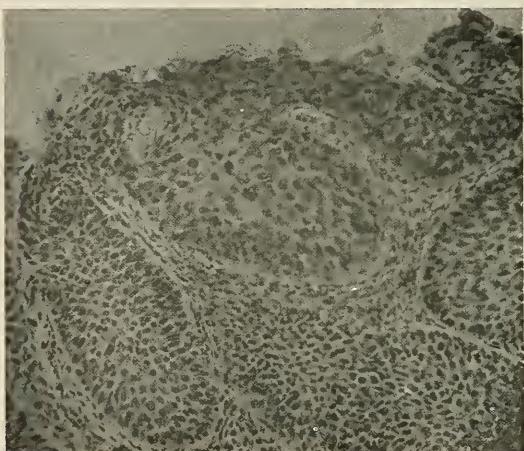


Section of segment removed for diagnosis. The squamous-cell carcinoma is replacing the normal epithelium of the cervix. The findings are typical of epithelioma of the cervix, or the so-called "chaneroid der portio" of the Germans.

been considered as primary and various classifications of the supposed types of chronic endometritis and endocervicitis, and are still so described. According to various investigators, there are no changes in the lining membrane of the uterus in the supposed chronic inflammations which are not duplicated in the normal menstrual cycle.

Hitschmann and Adler, in describing the normal changes in the menstrual cycle, divide them into four stages, and their findings are so far borne out by other observers.

" 1. The premenstrual stage, corresponding to the chronic glandular endometritis, begins six to seven days before menstruation.



A portion of the preceding specimen more highly magnified in order to show the type of cells and their arrangement in finger-shaped masses—findings that are typical of an epithelioma.

red blood cells appear, first in the superficial layers of the endometrium, then in the cavity of the uterus. The hemorrhage produces a rapid detumescence and emptying of the glands.

" 3. The post-menstrual stage, corresponding to the description of chronic interstitial endometritis, is a short period of comparative inactivity and rest. The mucosa appears thin and pale. The glands are straight, oval in contour, simple, and are lined with low, columnar epithelium. The stroma is composed of spindle cells. Secretion is entirely absent.

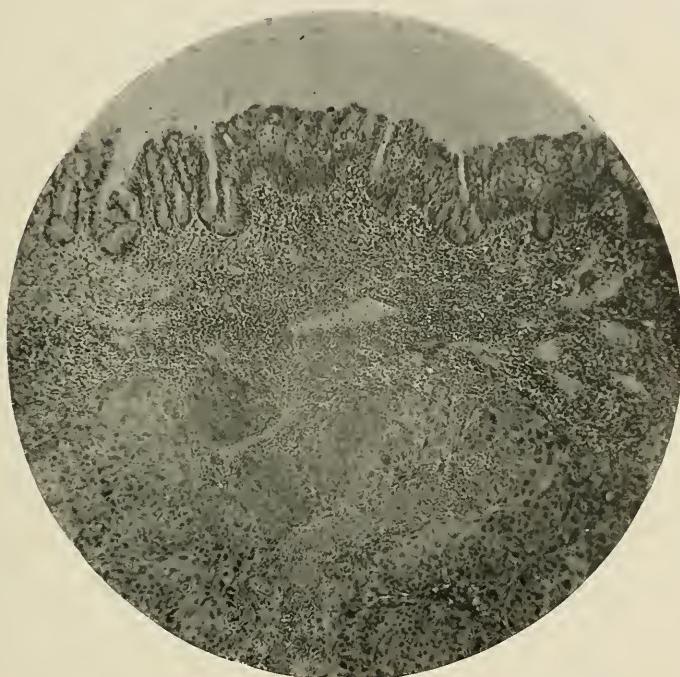
" 4. The final stage is characterized by renewed activity, mitotic cell division abounding. The glands increase in size, are at first

The mucous membrane is thickened and develops a deeper, spongy portion in comparison to the superficial compact layer. There is increased glandular activity, as evidenced by the swelling of the cells with encroachment on the lumen, the glands as a whole being more numerous, large, and tortuous, the stroma consisting of large cells of the decidual type.

" 2. As the time of menstruation approaches, the vascular engorgement becomes more marked. With the onset of menstruation

corkscrew in shape, and later approach the irregular premenstrual type. The epithelium likewise develops increasing activity, with increasing intracellular secretion, and the stroma cells become more succulent and translucent."

Many patients having all the symptoms formerly supposed to be pathognomonic of glandular endometritis, the increased bleeding and leucorrhea, have been shown by several observers to have no



Invasion of the cervical tissue beneath the intact epithelium by the cancer cells is shown in this section removed for diagnosis. The ill-defined line of invasion, the character of the invading cell, and the line of round-cell infiltration are characteristic.

demonstrable microscopical signs of inflammation; and many others without the supposed classical symptoms do present what is acknowledged by all who have studied this problem to be the only true test of inflammation—the round-cell infiltration from the blood plasma.

Clinically, it is evident that there are many conditions remote from the uterus that give the symptoms generally credited to

endometritis or endocervicitis; this is emphasized by the almost invariable failure of a curettage alone in curing the patient. Aside from a curettage done to complete the emptying of the uterus or to obtain material for diagnosis, I feel that the place for a simple curettage does not exist. From clinical experience, I feel justified in attributing all inflammations of the cervix, aside from infections, to some condition in the pelvis of mechanical production. There is



Section of segment removed for diagnosis. The diagnosis of adenocarcinoma of cervix is made because of the characteristic cells invading the tissue beneath the epithelium. There is no distinct line of demarcation between the cancer cells and the cervical tissue, but the surrounding line of the round-cell infiltration is marked and typical.

no doubt that ovarian, or possibly other ductless-gland pathology, may stimulate glandular hypertrophy or may give rise to the symptoms of leucorrhea and hemorrhage without pathological changes in the uterus, although severe glandular overgrowth often gives no such symptoms. In most cases, however, these symptoms are an attempt of nature to relieve the pelvic congestion, and as such are a benefit to the patient as long as the cause remains, but it is abso-

lutely essential to look far afield in order not to overlook the causation.

In this connection a detailed consideration of the pathological possibilities of endometrial changes resulting from causes away from the pelvis is not in place. Conditions that produce circulatory disturbances, especially those increasing blood pressure, are the pathological possibilities of greatest importance.

Some men claim that a displacement of the uterus does not pro-

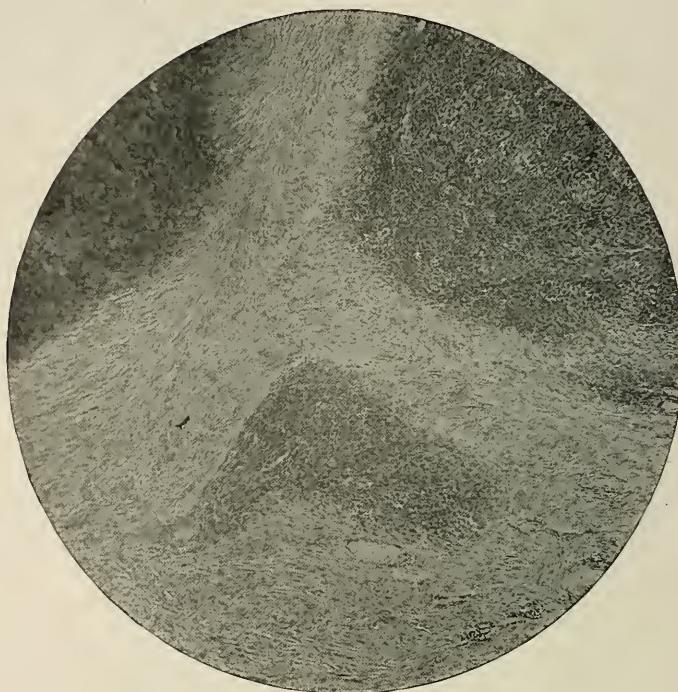


This section shows a typically malignant nodule situated in the deeper structure of the cervix. It emphasizes the possibility of overlooking a beginning tumor if small or deeply situated. The surrounding inflammatory infiltration is well shown.

duce congestion of that organ, and argue that because a uterus does not change in color when replaced it is not congested. It does not require much clinical experience to show that a uterus rapidly decreases in size when replaced or even held higher in the pelvis by tampon treatment. A knowledge of the course of the circulatory supply of the uterus with its tortuous vessels shows how a very little rotation may produce marked venous stasis. With the circulation interfered with, and often aggravated by improper clothing forcing down the abdominal organs and interfering with the ve-

nous flow, it does not need any infection to produce changes in the mucous membrane. However, all the conditions are present for the rapid growth of germs if implanted.

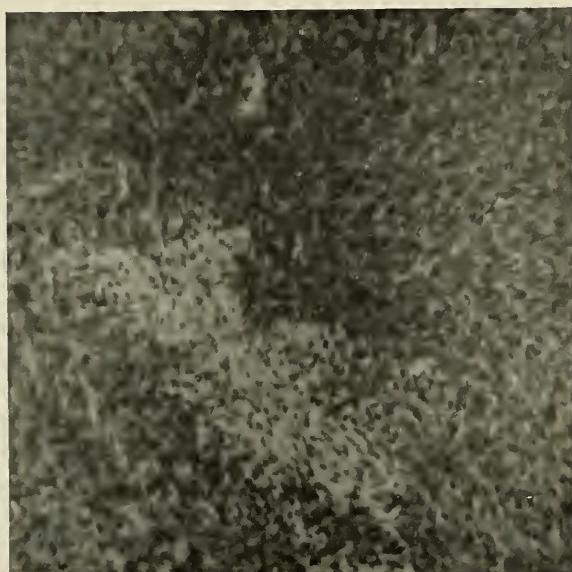
The mucous membrane, being the softest and most vascular tissue, shows the effect first, and the more readily so on account of its



The fibrosarcoma of the cervix is comparatively rare. In this section the masses of embryonic connective-tissue cells are embedded in the fibrous tissue with no distinct arrangement. The free blood supply is fairly well shown, the vessels exhibiting the characteristic thin walls of the sarcoma. The larger vessels have in places practically no walls, and these are known as "blood channels." It is this construction that accounts for the transmission of these growths by the blood stream.

physiological function. As the uterine cavity does not readily increase in caliber, the swollen membrane tends to seek the course of least resistance and is crowded outward, so that even in the uninjured cervix we get an everted mucous membrane. The continued internal pressure from the increased congestion gives in time a dilatation of the canal. In all these cases of long standing the canal is abnormally patulous. The mucous membrane, designed to occupy

a protected position, when forced outward toward the vagina, where the pressure of the adjacent organs has more effect, loses its single layer-cell covering and an erosion results. Within the canal the swelling and congestion tend to alter the secretion of the glands, which becomes thicker and more tenacious in character. The gland ducts become obstructed, and with the collection of the contents within the gland itself we find present what has been called a cystic endocervicitis, and later, as some glands crowd outward



This higher magnification of the preceding section of a sarcoma of the cervix shows the embryonic connective-tissue cells more in detail. The irregular arrangement of the cells, typical of malignancy, also more clearly shown.

toward the vaginal lining of the cervix, the development of the cystic cervix. This condition may have taken place with the mechanical interference to the cervical branches of the uterine arteries found in anteflexion as well as with the retrodisplacements and prolapse. Such pathology occurs more rapidly and markedly in a case of lacerated cervix where the wound has healed by granulation process ending in scar-tissue formation. The contraction of this scar tissue seriously interferes with the blood and nerve supply.

The old-time "ulcerated cervix" of the woman who has had

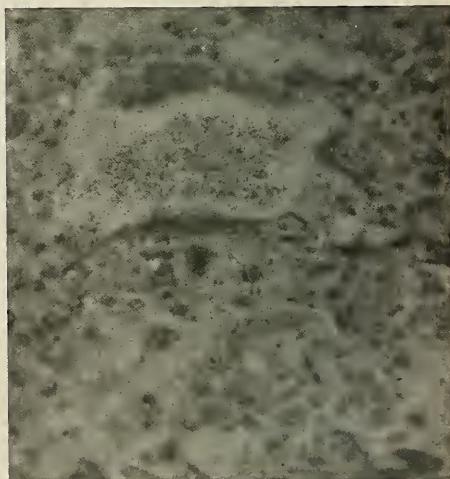
children is, as was first emphasized by Emmet, the end result of the "ectropion," or turning outward of the normal mucous membrane of the canal. The readily bleeding area around the os, which is looked upon as an ulceration, is the mucous membrane of the cervical canal eroded through exposure



A chorioepithelioma of the cervix. In this case the growth is situated beneath the intact epithelial covering. The irregular arrangement of the embryonic structures surrounding and penetrating the blood sinuses is typical of this type of malignancy. A chorioepithelioma must of necessity be associated with a pregnancy of some type or a teratoma, on account of the villi base. Pick has demonstrated the occurrence of practically all the body elements in teratomata, or so-called "dermoids," except the villi, but the occurrence of chorioepithelioma in non-pregnant women, and occasionally in men where "dermoids" existed, would seem to prove the presence of villi in such cases.

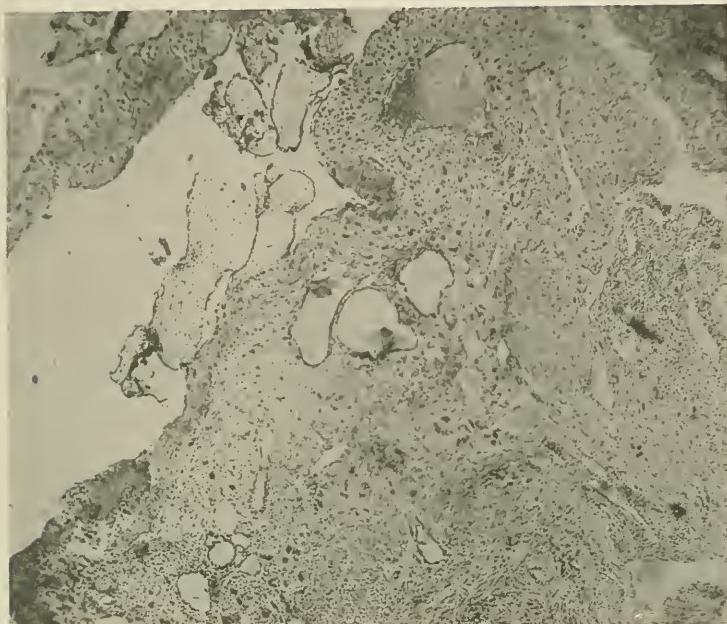


A section from a case of metastatic chorioepithelioma with the primary growth in the cervix. At abdominal section a diagnosis of tuberculous peritonitis was made from the gross appearance of the lesions. The tumor presents the characteristic appearance of this growth as well as some fatty tissue of the omentum from which the nodule was taken. The section is from the laboratory of Prof. Ludwig Pick.



A higher magnification of the metastatic chorioepithelioma on the omentum. It shows the typical elements of the growth and their relation to the blood cavities.

to friction, and further congested and swollen by nature's efforts to heal by lymph infiltration. This healing process imposed upon the mechanical congestion favors the overgrowth of the deeper structures and a hypertrophy of the ventral and dorsal lips results, which tends to further expose the canal lining. It has already been shown how the relaxed vaginal outlet, by its mechanical



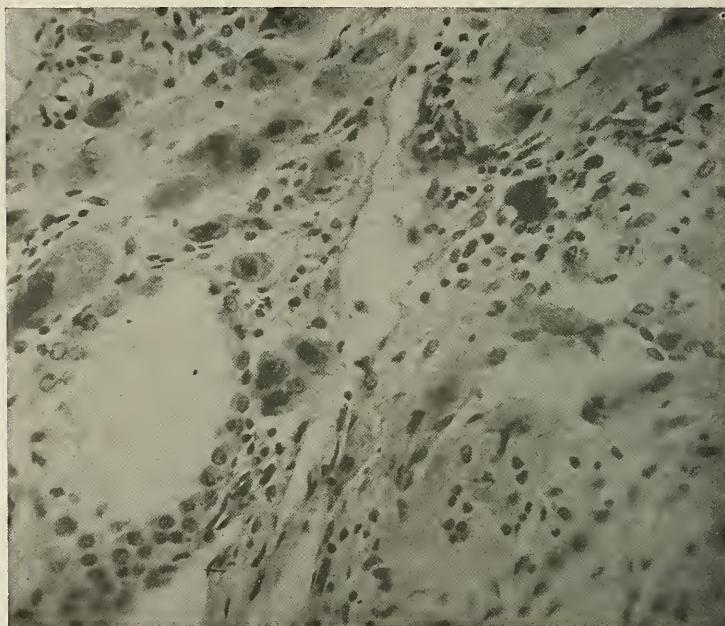
Chorioepithelioma of the cervix. The characteristic findings in this type of growth are the presence of villi elements, irregular overgrowth associated with large blood spaces. Pick says, "Villi hunt blood as a magnet hunts steel," and so, naturally, in the malignant development of these embryonic elements the same close association with blood cavities is present. In this specimen the villi are still intact, and there is marked irregular proliferation of the syncytial cells with invasion of the stroma.

effect, can produce the same general condition. Outside of these pathologies of the cervix, we can discard all the old-time varieties of cervical inflammations designated under the head of endocervicitis, for the round-cell infiltration alone can be considered diagnostic of chronic inflammation, and the presence of pus and germs of the acute.

In considering the question of cervical erosion I am limiting the discussion to those cases which are the result of passive congestion

or injury. These are the two types which naturally fall into the limits of this monograph.

I do not wish to be understood as including in this question of etiology the type of erosion and eversion found in infants, the congenital form; or that found in pregnant women, which is probably the result of overgrowth of glandular structure; or the type asso-



This higher magnification of the preceding section shows in detail the large, deeply staining Langhan's cells with their well-defined membrane and the smaller syncytial cells with indistinct cell membrane. These two elements are typical of the villi structure, but normally occur associated in single layers. In the malignant overgrowth these elements form in masses with no regular arrangement. Here the blood spaces are well shown, but with no blood elements present.

ciated with the presence of the gonococcus, diphtheroid bacillus, or other germs which cause irritating discharges. Eliminating these forms naturally takes out of the discussion the various theories advanced by Ruge, Veit, Fischel, Gottschalk, and others, which deal with the glandular perforation from below the epithelium, the subepithelial hemorrhage in inflammations, and the other processes which can produce erosions *in loco*.

The erosion under consideration is essentially an inflammatory

process associated with round-cell infiltration and scar-tissue formation. That the round-cell infiltration precedes the erosion in some cases is apparent, more especially so in recurrences.

The most common picture in the process of healing is the raw



A section of an eroded cervix. The stratified squamous epithelium has disappeared from a considerable area. The mucous membrane lining the cavity is also wanting. The eroded surface is covered by a blood-clot. Some of the glands are slightly cystic, and the tissue near the eroded area shows marked round-cell infiltration.

area covered by granulation tissue and that by pavement epithelium, to be replaced again later by the stratified squamous form. It is probable that in some cases the epithelial covering comes from the columnar cells of the cervix or from islands of epithelium in the raw area. In time this squamous epithelium is replaced by the more resistant, slower-growing stratified cells.

It is the round-cell infiltration, with its scar-tissue formation, interfering with the circulation and the gland secretion, that causes a recurrence and demands operative treatment for permanent correction.

In the chapter on the etiology of pelvic injuries the effect of the tight binder has been spoken of as a possible factor in preventing primary union of an injured cervix, and thus giving rise to the chronic pathological conditions just discussed. If, at the same time,

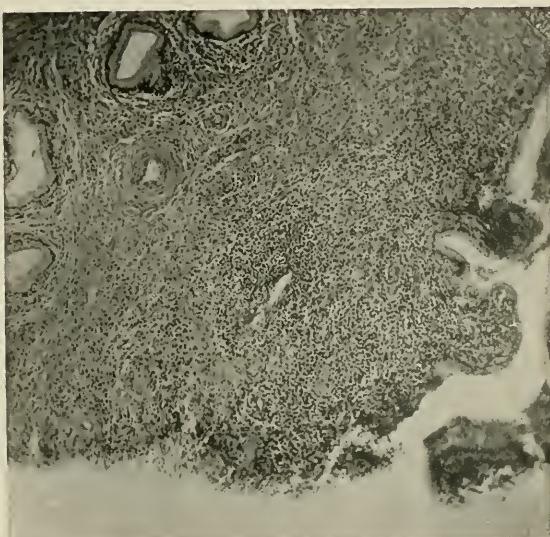


A section from an eroded cystic cervix. The glands are increased in size and number. One has become definitely cystic. The stratified squamous epithelium has been destroyed, and near the raw surface the inflammation, as evidenced by the plasma-cell infiltration, is marked. In this section there is some evidence of a beginning healing process.

on this granulating area any degree of infection is imposed, the greater degree of infiltration and the slower healing exaggerate the mechanical defect.

It will not be amiss here, while considering cervical pathology, to mention a factor which is not always recognized as of injury to the cervix, and that is the pessary. The pessary holds the uterus forward by a stretching of the upper portion of the vaginal canal, especially the dorsal fornix, also by a relative shortening of the sacrouterine ligaments through giving them a new point of attach-

ment at the pessary's transverse bar. Both these actions, while maintaining the position of the uterus, put tension on the dorsal attachments of the cervix, thus tending to separate the lips and exaggerate any defect. If a cystocele is present, it is partially relieved by the holding up of the vaginal vault and cervix and the stretching of the vagina laterally, but this gives no direct support to the body of the cystocele. Thus the weight of the urine is exerted between the bars of the pessary upon the rectum, and this is rather

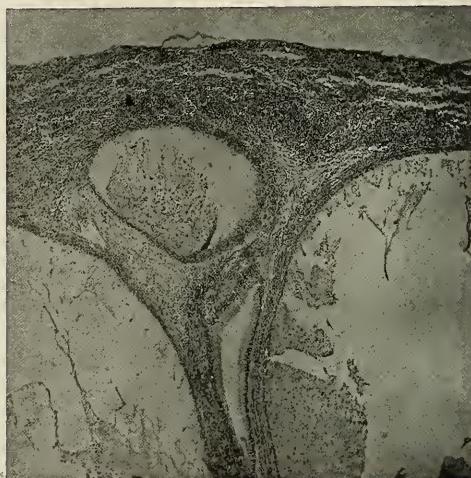


A more highly magnified section of a marked case of erosion. The gland epithelial covering is intact as far as the eroded surface. The extreme round-cell infiltration, with the ragged raw surface from which the epithelial covering has disappeared, indicates the acuteness of the pathology.

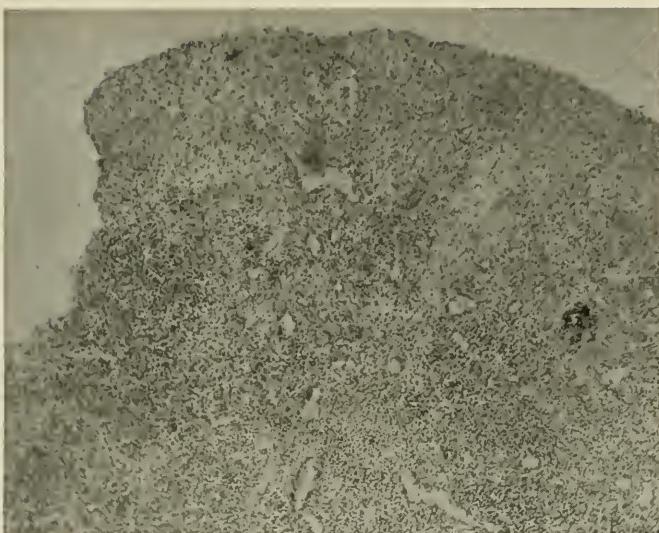
exaggerated, if anything, by the position of the fundus above. Naturally, the greater portion of this strain comes then upon the cervix, especially the ventral lip, and thus the pathology is rapidly exaggerated. In fact, so great is this pull on the cervix that in cases where a pessary has been necessary after a trachelorrhaphy, it has often been found that the new-formed line of union has stretched out markedly, and a recurrence of the ectropion has occurred, necessitating a second repair when the abdominal work is done.

In cases in which a relaxed vaginal outlet was not repaired at

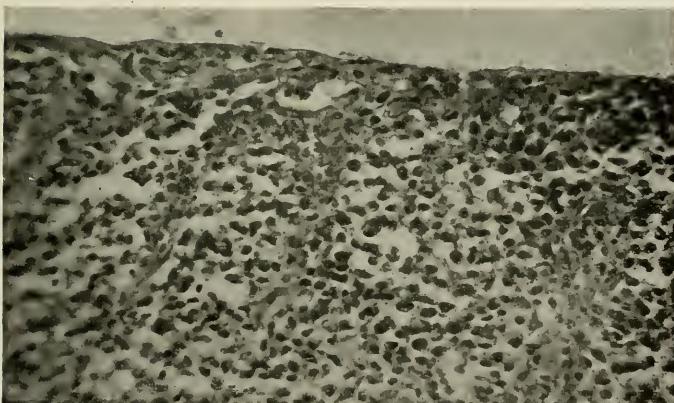
the same time as the cervix (which is by no means uncommon, through lack of recognition or lack of appreciation of the significance of a poor diaphragm support), the effect on the cervix is one of hypertrophy and elongation as a result of the pull from below, instead of the separation of the cervical lips. In time, with the falling of the uterus, the ectropion will occur.



Section from a cystic cervix that shows the loss of the stratified epithelial covering and the character of the cystic development of the glands. The cervical structure beneath the raw area shows intense round-cell infiltration. The cells lining the cyst cavities are uniform in structure, with an intact basement membrane. The cavities contain some round cells in the remains of the mucous secretion.



An eroded cervix that is beginning to heal. The infiltration is marked, but the glandular elements are not nearly so prominent in this case. The healing is taking place by the covering of the raw area with a single layer of squamous cells. These are replaced later by the stratified epithelium.



A more highly magnified portion of the preceding section that shows more in detail the process of repair. A fairly definite covering of a single-cell flattened epithelial layer has formed over the raw area. This layer probably has its origin from three possible sources: islands of epithelium that remained from the original covering; the epithelium lining the gland ducts; or the edges of the intact mucous membrane. This single layer of cells is gradually replaced by the stratified epithelium of the cervix. The round cells beneath form more or less scar tissue, which is one of the reasons for a recurrence of the condition.

## SYMPTOMS OF CERVICAL PATHOLOGY

**I**T IS not possible to differentiate any symptoms or any set of symptoms as typical of cervical injury or inflammation. The symptoms that we get with these two classes of pelvic pathology are, as with many other pelvic abnormalities, the result of the associated or resultant congestion.

The leucorrhea, probably the most noticeable and often the earliest sign, is nothing more than the increased secretion of the uterine and cervical glands, the function of which is stimulated by the greater blood supply. If this discharge is of a thick, tenacious character, it probably has its origin from the glands within the cervical canal, for the uterine gland secretion is of a more watery nature. This cervical discharge is so tenacious in some cases that it is almost impossible to wipe it away without the aid of some chemical reagent to coagulate or dissolve it.

The normal reaction of the uterine secretion is alkaline, but in many of these inflammatory processes it is acid, on account of a superimposed bacterial growth. The tenacious character of the discharge and the change from the normal reaction are often the factors that prevent pregnancy. Outside of the appearance of the cervix, they are the only signs that might be considered typical of cervical pathology.

With many cervical abnormalities, we find increased or irregular menstruation, and this is especially so with the cystic cervix. Such symptoms indicate simply an increased blood supply. The mechanical irritation of nerve endings through involvement in the scar tissue may possibly have considerable reflex effect in producing this congestion. Associated with the uterine hyperemia, there is always a more or less marked congestion of the ovaries, and probably this ovarian irritation also stimulates the uterine flow.

In women nearing the menopause we have other causes for menorrhagia or metrorrhagia, such as a sclerotic degeneration of the uterine blood-vessels or a polypoid growth of the mucous mem-

brane. These are conditions that do not present enough gross pathology to be readily recognized, and an associated cervical pathology may be given credit for the increased flow. There are again general systemic conditions causing increased bleeding, which may also be overlooked.

A very frequent symptom associated with the abnormal cervix is the irritated bladder. The close relation of the cervix to the bladder anatomically, with the common source of blood supply, will always produce an associated congestion in the bladder, especially at its base. It is this congestion that accounts for the bladder symptoms. In these cases the cystoscope shows a congested trigone or the papillary enlargement at the internal sphincter, the latter being especially characteristic of pelvic congestion. The urine shows no change unless the enlarged cervix by gravitation drags down the bladder, producing a degree of urine stasis. In such cases there is associated a mild grade of urosepsis, indicated by a bacteriuria. The symptoms complained of are the frequent and sometimes painful micturition with a feeling of incomplete evacuation.

A woman complaining of these symptoms should not be allowed to go without a thorough examination. In nulliparae the symptoms may only be an indication of a pathological anteflexed uterus; but with that is usually associated the painful menstruation characterized by pain appearing some hours before the flow and usually relieved thereby. However, in later life, with the further pathological changes, which result in an enlargement and softening of the uterus, the pain may disappear. A pain continuing after the flow is well established is usually indicative of complicating tubal or ovarian pathology.

It is necessary to bear in mind that, on account of its histological structure, the cervix is not capable of giving rise to any very



Erosion of the uninjured virgin cervix. The dark area around the os is the eroded portion.

marked symptoms directly, and consequently only indirectly does it indicate its condition. When that indication is prominent, the degree of pathology is usually marked. This, however, does not apply to the reflex nervous symptoms, which will be considered more in detail in the discussion of the relaxed vaginal outlet, since the two are frequently associated and the reflex symptoms of both are similar; yet any of the reflex symptoms found with pelvic congestion may occur with the cervix alone as the etiological factor, while the local signs may not have particularly attracted the woman's attention.

In conclusion, it is necessary for us to remember that the pathology of the cervix has no definite symptomatology, and that the leucorrhea, menorrhagia, metrorrhagia, with bladder irritation, backache, and reflex nervous symptoms, so frequently given as indicative of cervical abnormalities, are purely the result of the associated congestion. The presence of one or more of these symptoms should lead to a thorough investigation of the pelvis as a whole, with the realization that the cervical condition alone is sufficient to account for all these symptoms, though there is always a likelihood of an associated pathology.

## TREATMENT OF CERVICAL PATHOLOGY

THE treatment of the pathological conditions of the cervix is essentially surgical. Apart from the acute venereal involvements, it has been shown that in the majority of cases the abnormalities of the cervix have a mechanical origin. It is necessary, therefore, in order that permanent results be obtained, to correct the mechanical defect, and this naturally involves surgical procedures.

Without doubt, local applications to the uterus with the customary depleting methods have a place of great value. In most cases, however, this treatment is mainly of advantage as a preparation for operation or a post-operative procedure to correct a lingering inflammation.

In cases of marked cervical congestion associated with laceration, Emmet recognized the fact that the discharge persisted for some months after the operation, and he, with others, advised and practiced treatments for long periods preceding the operation, with the hope that this would clear up the discharge more rapidly. We realize now that such preparatory treatment is of value in cases of marked hypertrophy or cystic formation, especially if combined with scarification and the puncture of the cysts. But it is not necessary to extend the treatments beyond the point of the first improvement, for the operation will promptly take care of the balance of the congestion. It is not uncommon in some cases to find a persistence of the leucorrhea for a few months after an operation, but if the work has been correctly done this in many cases finally disappears, even without treatment. A certain amount of discharge is probably the result of the presence of the absorbable sutures within the tissue; for, no matter how little previous inflammation or how slight the operation, when absorbable sutures are employed, a discharge appears after a few days and persists until the catgut disappears.

It is true that by treatment we can clear up severe cases of

ectropion, but naturally such cases do not stay cured, since the causative factor remains. There is still another reason, aside from the primary etiology, for the period of only temporary improvement, and that is the round-cell infiltration concurrent with the mucous-membrane irritation and erosion. This plasma-cell process results in more or less scar-tissue formation, even below the re-formed mucous membrane, which naturally interferes with the gland ducts, tending to the production of cystic glands. It is natural, then, to find a patient with such pathology returning in a few months with a similar if not a more severe condition.

In the acute venereal inflammations of the cervix, prompt improvement is usually obtained from the application of silver nitrate solution to the surfaces involved, and such application is of especial value where raw surfaces exist. Ten- to twenty-per-cent solutions are usually of most value. Argyrol in twenty-per-cent, protargol in five-per-cent solution, or some of the other numerous organic silver salts, are much used, but in this particular location, as well as in the vagina, they are by no means as satisfactory as the silver nitrate. Experimental work reported by Noble upon the germicidal value of silver nitrate, as compared with protargol and argyrol, has shown that the latter drugs, which come in the class of organic compounds, have little value as gonococcides. In gonorrhœa the silver-nitrate applications, followed by yeast or Cervisine tampons, usually yield prompt results, unless the process has extended above the internal os so that there is reinfection through the discharge from above.

A primary or a secondary syphilis seldom calls for treatment, for in the majority of cases the condition is overlooked, and naturally in time responds to the systemic medication. In case the lesions are discovered, they may be treated as is similar pathology in other parts of the body.

In chronic conditions of the cervix, the usual routine treatment has as its basis applications of some antiseptic or caustic applied to the cervix and its canal, followed by depleting drugs placed upon tampons or used in the shape of suppositories. The once commonly advocated treatment of applying drugs to the cavity of the uterus itself has fortunately fallen into disuse. There is danger of

producing sudden severe collapse followed by peritoneal irritation through direct passage of the drug to the peritoneum, even if used in mild solutions. Obliteration of the cavities of the uterus or tubes, if stronger caustics are used, is not at all impossible. In fact, literature has numerous examples of such misadventures. On the other hand, it is very questionable whether such applications accomplish any good purpose. Lately a suggestion has been made of injecting just before abdominal section a twenty-five-per-cent solution of tincture of iodine, in order to determine the patulousness of the tubes. In some rare cases this may possibly be of advantage, but we must bear in mind the marked irritation that iodine exerts upon the peritoneal surfaces, and that the result may be a secondary closure of the unobstructed tubes.

The most widely used application to the cervix is probably Churchill's tincture of iodine. It is antiseptic, somewhat caustic, and by its ready absorption penetrates more readily into the tissues. Iodine thus applied, it has been demonstrated, can be recovered from the urine within fifteen minutes. This shows how rapidly some drugs can be thus absorbed, and should warn us against the use of too poisonous applications.

Ichthyol, ichthyol with guaiacol, the organic silver salts, carbolic acid followed by alcohol, picric acid, tannic compounds or tannic acid in tincture of iodine are favorite applications of some gynecologists, though it is questionable if just as much, if not more, good is done by the use of the iodine tincture, unless the patient has an idiosyncrasy to iodine. Silver nitrate and picric acid, on account of their coagulating action, have a narrower field of usefulness, but properly used, in their individual sphere, are of greater value than any of the other drugs mentioned. In some chronic infections basic fuchsin in saturated aqueous solution is very serviceable.

Practically, all tampon medicants contain glycerin or boroglyceride, or both, for such drugs applied to the cervix produce a serous exudate that depletes the circulation, thus helping to relieve the congestion. In case a tampon of elastic material is used, this process is further aided by the elevation of the uterus and the resulting improved circulation. It is mainly in this particular that the

largely sold proprietary tampons fail; the drug ingredients used are of value through the antiseptic and depleting properties, but no self-applied tampon or no enclosed tampon, even if inserted by the medical attendant, can ever be properly placed to obtain the greatest benefit. Consequently, the cheaper vaginal suppositories accomplish just as much when home methods of treatment seem warranted.

While glycerin is an excellent depletive for ordinary use, if very active depletion is desired, a powdered C.P. magnesium sulphate is of value, applied as a dry powder upon the tampon or made up as a vaginal suppository.

The tampon itself is most serviceable when made from carded Australian lamb's wool. This may be obtained in rope form, so that the required length is easily cut off, and with a soft string of Dexter's cotton attached to the middle its withdrawal is made easy for the patient. The carded wool is non-irritating and is sufficiently absorbent, so that there is no necessity of having a covering of cotton. It is also remarkably elastic, does not become packed, like cotton, and, consequently, holds the structures upward with no injurious effect. A little advice to the patient regarding its removal is wise, for if it is withdrawn too suddenly the suction action will often in acute conditions cause pain, as well as tend to reproduce a replaced retroverted uterus. When cotton is used for tampons, it becomes so packed when moist that upon withdrawal it will act as a piston, tending to drag down the structures above. These local treatments should be augmented by the long hot vaginal douche, directed to be taken at home upon the removal of the tampon. No tampon should be permitted to stay longer than twenty-four hours within the vagina, on account of the ready decomposition of retained secretions.

The value to be derived from a hot douche comes only from an application of the heat sufficiently long to accomplish the contraction of the vessels. Any douche of short duration had better be used at body temperature, in order to avoid a dilatation of the vessels with the resulting increased blood supply, which is always the first action of hot applications. To obtain the contraction of the capillaries, the douche must be of a temperature of at least 110° F. and of

continuous application for at least ten minutes, or better twenty. To obtain the best results, the woman must be on her back, for this allows the thorough bathing of the cervix and vaginal vault in the hot fluid. No great pressure is advisable, and the container should be so hung as to give a slow stream, and more hot water added from time to time to maintain the temperature. To the water may be added sufficient salt for a physiological salt solution, or the same proportion of sodium bicarbonate. These ingredients help to liquefy the secretions, thus washing them away more easily, and if the discharge is excessively acid the soda will neutralize it somewhat. There is no objection to, and there may be great value in, combining both drugs. An antiseptic such as lysol, which by its soapy character and alkaline reaction dissolves and neutralizes the secretions, may be used, though little can be expected from the antiseptic itself, and much more can be accomplished in that way by direct application of iodine or argyrol to the cervix and vagina. If we desire an astringent action, a draehm each of zinc sulphate and alum for each quart of water may be added to the last of the water used, thus avoiding the use of an excessive quantity of the prescription. If the discharge is odorous, a solution of permanganate of potash is useful; but under no conditions, except syphilis perhaps, is the use of bichloride of mercury or other mercurial salts indicated. In most women, used even in moderate quantity, these are irritants, coagulating instead of removing the secretions, and are capable of producing toxic symptoms through absorption.

It is well to bear in mind that some women are able to stand excessively hot douches, and the use of such are followed by considerable relaxation of the tissues rather than the toning up desired. Consequently, it is well to order a bath thermometer and advise the temperature to be kept between 110° and 115°.

A few weeks of treatment of this character will usually accomplish all the improvement that we can hope to gain in this way. So, if the pathology persists, any doubt of the necessity for more radical treatment is removed.

## IMMEDIATE REPAIRS

THE ideal treatment of the injured cervix would naturally be the repair at the time of labor. Such a procedure, however, is in most cases too difficult to be readily accomplished under the conditions surrounding confinement work outside of a hospital. The factors determining most writers' recommendation to leave the injured cervix alone have already been discussed.

In all cases of severe laceration of the cervix, with or without bleeding, a careful repair does not add to the risk of infection if the asepsis is good. In fact, closing in the raw areas will lessen the risk of autoinfection. If severe bleeding occurs, it is, of course, necessary to control it by suture, no matter what the environments. Grasping the cervical lips with two double vulsellum forceps, through a Graves operating speculum it is possible to readily locate the torn edges and by traction downward facilitate the introduction of the sutures. Sutures of silkworm gut or silver wire, which do not stretch or swell and leave no foreign culture medium in the tissues, are best suited to this particular need. These should be tied tight enough to hold the parts in approximation even after the uterus has undergone its preliminary rapid involution, though care must be taken to avoid tension of a degree that will strangulate the tissues. The results in many cases will be as perfect as a later Emmet operation.

The immediate repair of the injured outlet is a problem to be considered independently of the relaxed vaginal outlet, for here we do no denudation, and the question involved is one of correct approximation. It would seem as if this approximation of the raw surfaces in their original location was a simple matter, but there are always factors involved that tend to render the work difficult.

As a rule, the patient is cared for under conditions which do not favor careful examinations or easy manipulations. The patient having accomplished the birth of the child, is impatient of any further inconvenience. The giving of more anesthetic is not always

desirable. The field is obscured by blood, and added to this the inconvenience of having to do the work upon a bed, in place of the almost essential table, makes thorough examination of the injury almost impossible. These factors combined with the lack of assistants to aid the already tired-out nurse and attendant prevent careful and sometimes necessarily elaborate repair.

However, the time chosen for the repair is important. There is no doubt that the best results are obtained when the work is done immediately after the completion of labor. Some authorities advise the placing of the sutures while waiting for the birth of the placenta. If this is done, and the repair is made with interrupted sutures, it is important that they should be left untied until after the delivery of the placenta, or the necessity for further uterine manipulations is ended.

The Berkeley and Bonney Gynecology says: "The perineum should never be repaired until it is certain the uterus has satisfactorily contracted, for if digital exploration is required, the sutures will be torn out."

If the sutures are torn out, the fact will, naturally, be recognized, and they will be replaced. The possibility is that, instead of tearing out completely, the sutures have cut through only a portion of the tissue, and this will pass unnoticed. The tissues at this time being soft and friable and the sutures more resistant, a certain amount of cutting by the latter readily takes place when any strain is applied. This naturally interferes with healing through the imperfect approximation. Such is not so largely true with the operation advised later on for use in immediate perineorrhaphy, for then the tissues slide along the silkworm gut when stretching takes place and the slack can readily be taken up.

Exactly the same factors, it will be seen, concern any interrupted suture repair when the secondary swelling takes place.

It is the practice of some men to delay repair for twenty-four hours or more, with the expectation that by that time the immediate swelling will have subsided and the patient be in better condition. An extensive repair then necessitates an anesthetic. By this time, though the primary swelling has subsided somewhat, the soft mucous structures are still swollen out of proportion to the parts

most important in the correct approximation. The muscle and fascia structures have thus not only assumed a less proportional value in size through this swelling, but also have retracted more, so that a correct repair by the ordinary interrupted suture is difficult. It is also probable that the tissues have in a way lost some of the ability to produce primary union without an excess of round-cell infiltration, which results in more than the normal amount of scar tissue.

The antiseptic action of normal lochia prevents infection of a mild type, but that possibility of contamination, which is always important in wounds elsewhere in the body left open twenty-four hours, is not of such great moment here.

If the delay in repair has been absolutely necessary, on account of the patient's condition, I think it is wiser, when considered wholly from the standpoint of perfect future results, to wait until the tissues have assumed a more normal condition. In fact, I prefer to wait until a denudation has to be done. It is not often necessary to put off a repair, and, naturally, each case has to be considered in the light of the particular circumstances. The involvement of the anal sphincter in the injury will always necessitate an earlier operation for the comfort of the patient and on account of the atrophy of the muscle.

Sometimes it may be necessary to aim at a partial improvement of conditions rather than the ideal we desire; but it stands to reason from our knowledge of healing processes that the earlier the approximation is done, provided we do not propose to wait until the raw areas have healed by granulation, the more perfect will be the results.

The method used for the immediate correction of the vaginal injuries must depend wholly on the character of these injuries. A tear involving only the skin or mucous membrane, and which interferes in no way with the integrity of the floor or diaphragm, needs only a few superficial sutures for approximation.

No matter how slight the injury, it is well in all cases in which there are no contraindications to close the raw area, in order to avoid possible infection. But if for any reason it is deemed best to do no repair, nature, as a rule, favors rapid granulation and protection.

For perfect secondary results in cases in which the injury is more extensive, it is important to recognize the extent of the tear and use some method of approximation that will unite in correct apposition the corresponding layers.

The severe cases of perineal injury offer diagnostic difficulty only in determining their extensiveness. It is not an uncommon experience to find, on careful examination, after the blood from above has been temporarily excluded by a vaginal pack, that the injury has extended much farther up than was expected. In a forceps delivery the injury most frequently assumes the "Y"-shaped form already described. Sometimes the stem of the "Y," which represents the injury to the central tendon, is wanting, on account of the stretching rather than tearing of the elastic tissues of the perineum. Usually, however, there is at least a skin-rent in this direction. Consequently, unless the patient is carefully examined on a table in good light, the injury higher up is overlooked.

If this injury occurs on both sides, the retraction of the muscle fibers of the levator ani with the contraction of the circular fibers of the vaginal wall tend to elevate the "V"-shaped segment of the vagina. The natural inference in such cases is that the apex of this inverted "V" ought to be brought down by the sutures to the point that corresponds to the normal posterior commissure. If we do this, we are separating the surfaces of the pelvic diaphragm that should be approximated and are attaching the dorsal vaginal wall to the central tendon without the interposition of any supporting structures. A rectocele very promptly develops when the erect posture makes the weight of the rectal contents bear on the unsupported dorsal vaginal wall.

Such an injury should be dealt with by pulling up out of the field this segment of vaginal wall and approximating beneath it the levator ani, so that the completed operation will place the apex of the "V" a little distance within the vagina, this distance depending on the extent of the injury.

If the repair is done with interrupted sutures, the lowest suture may be placed first, and if left untied and used as a retractor, pulling downward when the next higher one is placed, it is thus possible to build up the perineum from below. This gives an idea of the

position the "V" segment should normally occupy. Then the angles of the "Y" can be closed above the pelvic diaphragm. The sutures are always tied from above downward. By this method we are sure of obtaining correct approximation of the floor and diaphragm without interposing the vaginal wall.

There is a variety of tear which occurs rather frequently, but is exceedingly difficult to diagnose at the time of labor. This is where the pelvic diaphragm gives way beneath the vaginal walls and the pelvic floor and is not accompanied by superficial injury. This class of defect explains some of the cases where a woman is told she has not been "torn," but nevertheless the relaxed vaginal outlet develops in spite of the promises of good results.

There is no consensus of opinion as to the proper procedure for correction. Theoretically, the most desirable treatment would be to lay open the superficial structures, and then to approximate the tissues from within outward. If the aseptic conditions of the surroundings are good, and there is no contraindication in the patient's general condition, such treatment would be by all means the most advisable. In the absence of favorable aseptic conditions, the surgical indications are for a postponement of the repair to some future date.

As a rule, it is not difficult to determine whether or not the external sphincter ani has been injured, for the cleft is usually evident down to, even if not through, the rectal mucous membrane. It can hardly be overlooked if searched for carefully. The question of getting uniformly good results from the operation is another matter, for the average method of repair with interrupted sutures, especially when of absorbable material, is often a failure.

My experience, covering a period of years, with the use of non-absorbable sutures in immediate perineal repairs prompted me to report my findings for the California State Medical Society at its meeting in the spring of 1911. The consciousness of the need of a better technique had been present in the minds of other operators, for some time after the reading of my paper I was pleased to observe in the *Journal of the American Medical Association* of February 1, 1913, a paper by Dr. Greer Baughman, of Richmond, Virginia, read before the Medical Society of Virginia in October,

1912, advocating practically the same procedure. Dr. Baughman gives credit to his colleague, Dr. Charles R. Robins, for the suggestion.

I shall quote from the paper I then read to emphasize the importance of a procedure that will attain more satisfactory results than now prevail. In part my paper was as follows:

"A prominent general practitioner in discussing perineal repairs at a society meeting made the statement that he never allowed any degree of tear to go unrepaired, for he did not intend that any woman whom he confined could be told that she needed a perineorrhaphy. That is the feeling and practice of all conscientious obstetricians, and yet when a patient who has a relaxed vaginal outlet is told that she has to have a repair, she invariably tells you that her doctor sewed her up when the baby came and also how many stitches were taken. But this only goes to show that a large percentage of repairs in recent tears result in failure, and unless the attendant can recognize early the cases of failure, the patient gets out of his hands with a false sense of security as to her good condition.

"Lately, due to the rather large proportion of unsatisfactory results with the use of the interrupted suture, I have been applying the continuous mattress suture of silkworm gut advocated by Dr. Geo. B. Somers of San Francisco for secondary perineorrhaphies."

My technique is as follows: Using a small curved needle while the edges of the tear are being retracted with vulsellum forceps, the first suture is applied from side to side in the depth of the wound, the tissue being finally pushed back along the untied stitch. The second suture is applied in the same way above. In this way one can approximate the divided perineal body and prevent the retraction of the torn musculature. While this type of suture is much harder to use in these immediate repairs than the interrupted, on account of the rapid swelling of the parts and the quantity of obscuring blood, the advantages gained and the much more satisfactory results make the extra care well worth while.

The continuous suture does not constrict the circulation as does the interrupted. It approximates the perineal body throughout its entire depth, and after the edema and swelling have subsided there is no slack on the sutures; or, if there is, it can be taken up by

pressing the tissue back along the stitch. If interrupted sutures are used, we shall find after the swelling has subsided that the swollen tissue in the grasp of the suture has been partially cut through and that the stitch is too loose to give a perfect approximation, and so the fluids can percolate and prevent perfect primary union. If by any chance infection of the perineum has occurred, the insoluble continuous suture acts as a drain, and whatever swelling takes place can be accommodated on the untied sutures without any cutting through of the tissues, so that the results are good. This would be impossible if the repair had been done with either absorbable or non-absorbable interrupted stitches.

Sometimes the rectal sphincter is injured and overlooked, on account of the difficulty of thorough inspection. It is not of such vital importance if we succeed in getting a good perineal body by primary union. It is not the severance of the sphincter-muscle fiber that is of such moment, for that is often done intentionally in fistula operations without bad effect; but it is the poor perineal results with the retraction of the muscle layers, and the consequent lack of ventral anchorage, that allow the retraction and atrophy of the rectal sphincter. If, despite our failure to unite the torn sphincter, we have succeeded in getting an otherwise normal perineum, then the muscle will not lose its function.

If we consider the injured sphincter ani from the standpoint of the fistula operation, we find that practically all authorities agree that it is the multiple or the oblique incisions of the muscle that are likely to be followed by incontinence.

In discussing the operation for rectal fistula, Earle states: "Incontinence of feces may follow any of the operations for fistula, but it generally results from an oblique incision of the sphincter muscle, which should always be avoided."

Fortunately, in complete tears of the perineum the sphincter-ani muscle is torn through in the median line on account of its anatomical relations to the central tendon and coccyx. An oblique tear is hardly likely to occur, for the force required to accomplish this would more naturally expend itself in separating the whole sphincter along the cleavage line between it and the rectal sling of the pelvic diaphragm, so that the rectal orifice with its sphincter mus-

cles would be drawn to one or the other side and left uninjured. It is this anatomical relation which accounts for the possibility of obtaining good fecal control under the conditions described.

Naturally, the ends of the torn sphincter ani have a more ragged character than the cut muscle of the fistula operation, and perfect continence may not come until the scar tissue has contracted permanently.

For the purposes of repair, every perineal injury must be studied individually. In extensive "Y"-shaped injuries, the continuous mattress suture used alone is difficult to apply. In the majority of cases, it is easier, and perhaps wiser, to approximate the upper limits of the injury with interrupted sutures, starting the continuous suture at the point just above the levator-ani muscle. It is from here outward that the important structures lie, the approximation of which is essential to good results. There is no reason, however, why the whole repair cannot be done with the continuous suture. It usually needs four sutures to properly unite an extensive injury so that the sutures can be used alternately in the lateral tears, which are naturally less than half the depth of the external portion. The only disadvantage is the difficulty of insertion and the length of suture to be removed. The tissues, however, remain soft for some time after confinement, so that, as a rule, the sutures are easily withdrawn.

It is not necessary, in fact I think it is sometimes unwise, to approximate with any buried absorbable suture the sphincter ani, if injured, for the continuous suture can easily be made to accomplish the same result.

After three more years' experience in using this method of repair, I feel that it is the only reliable procedure in such work. As a proof of the results, I had a counterclaim in a suit for fees against a patient who, at the instigation of a general practitioner, was threatening suit for having given her too good a perineum. This physician examined the patient for the first time eight months after confinement, and on the witness-stand testified to finding an ulceration of the vulva and being unable to make a digital examination. Yet he was positive that his inability to make an examination was due to a too perfect perineorrhaphy rather than to the local

conditions and the vaginismus he testified were present. My own records show an examination of the patient two months after confinement, when the perineum was found in perfect condition, and examination with the ordinary speculum offered no difficulty, though even two months previous to labor the vaginal canal had been extremely small, only admitting a virgin speculum.

I do not believe that it is possible in a perineorrhaphy at the time of labor, especially in a case in which there is no denudation done and no loss of tissue, to get any smaller vaginal canal than formerly. Anatomically, it is out of the question to build up a perineal body beneath the mucous membrane better than nature originally provided. With sloughing of mucous membrane and later scar-tissue contraction, it is possible to get a too narrow vaginal canal, but such a condition did not exist in the case mentioned.

In this chapter I do not consider in detail the continuous mattress suture advised, for it will be spoken of under operations for secondary repair.

## CURETTAGE

**A**S AN accompaniment of pelvic plastic work, a curettage of the uterus is of value, unless there is a latent infection in the uterus or tubes. By the removal of the mucous membrane, we deplete the circulation of the uterus somewhat, and give that organ also a chance to reproduce a new membrane under the favorable condition of rest in bed.

In cases of suspected malignancy we have in a careful curettage,

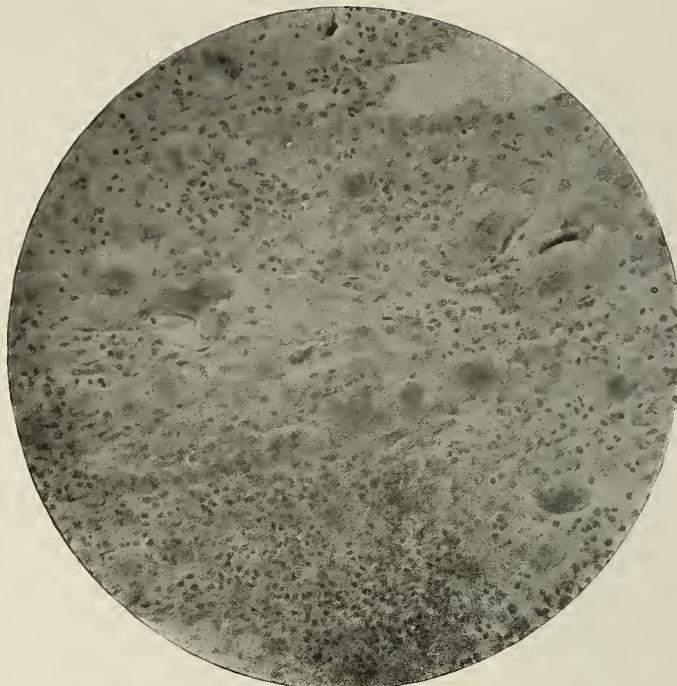


This illustration is from a frozen section of endometrium removed by curette. Decidual wandering cells are present in large numbers in the tissue. There is marked round-cell infiltration. The possibility of mistaking such a section for chorioepithelioma is great. These cells normally persist in the uterine mucosa for some time following pregnancy. The tissue lacks the elements of villi formation with the blood cavity association that is indicative of chorioepithelioma.

done to obtain tissue for microscopial examination, a valuable aid to diagnosis, and in polyp formations of the mucous membrane it is an essential treatment. But outside of these indications, unless done for the purpose of emptying a uterus of abnormal structures, such as a hydatid mole, or retained products of conception,

the curettage as a treatment by itself is practically seldom indicated.

The more skilled the physician is in diagnosis, the less frequent-



An enlargement of the preceding section that shows more in detail the decidual wandering cells. The comparison with the higher magnification of the vaginal chorioepithelioma section is of interest. The wandering cells and villi elements are always found in the mother's structures, on account of the close relation of the fetal elements to the blood stream. Under normal conditions, these elements, being fetal, are destroyed by the mother. They have no tendency to reproduction, and, even if in excess and increasing, will disappear with the improved resistance of the mother. Ludwig Pick believes that the villi elements (the Langhan's cells and syncytium) may produce wandering cells, or vice versa, though one probably predominates at the start. If continued scrapings of the mucous membrane show the persistence of these wandering cells for a considerable time, he advises the removal of the uterus. In the majority of cases, however, the fetal elements disappear in a few months following a termination of conception.

ly does he resort to curettage, for he learns by experience that the group of symptoms supposed to indicate an endometritis, so-called, is nothing more than an indication of pelvic congestion that

has as its origin some pathological condition often situated outside of the uterine cavity.

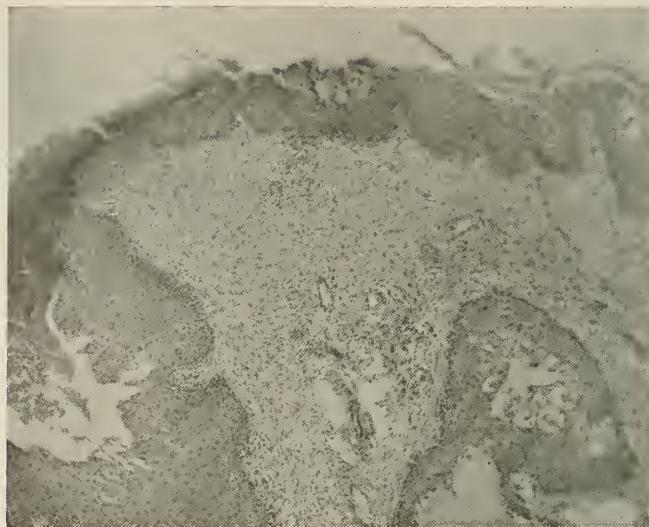
Curettage done at the time of the correction of pelvic pathology is in non-infectious cases a wise procedure, for the depletion of the uterus accomplished is of benefit. In cases associated with acute infections it is an unwise treatment, as we open up new lymphatic spaces and break down nature's protections. In cases of miscarriage many writers recommend non-interference, even though the



A polyp of the cervix. The forceps grasps the cervix above the tumor.

possibility of hemorrhage or sapremic infection is always a factor to be considered.

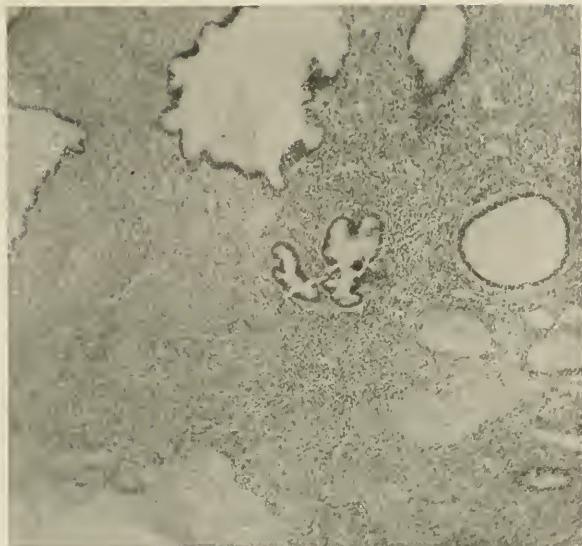
The serrated curette of Kelly is by far the most useful type of instrument to employ, for with it the mucous membrane can be removed in larger segments, and this is an advantage if microscopic examination is indicated. The removal of the membrane also can be done more thoroughly without as much danger of penetrating the uterine walls. The main purpose to accomplish in the operation is to make sure of a thorough curetting of the cavity so as to leave no shreds of membrane incompletely separated. Otherwise, we have the factors present favorable for a sapremic infection. The possibilities for harm from the curette in the unskilled



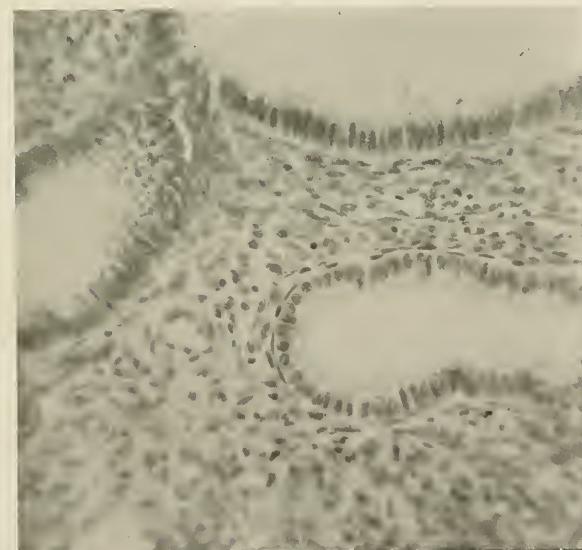
A section from a beginning cervical polyp, removed for diagnosis. The condition present is one of chronic inflammation accompanied by marked increase of the squamous cells. The unbroken line of demarcation between the epithelial covering and the cervix beneath is characteristic of non-malignancy. Such proliferation of the epithelial layer is often found in benign polyps.



This specimen shows a non-malignant polyp of the cervix in which many of the glands are cystic. The typical stratified squamous epithelial covering, and the normal structure of the glands as shown in detail in the higher magnification, are evidence of a non-malignant growth.



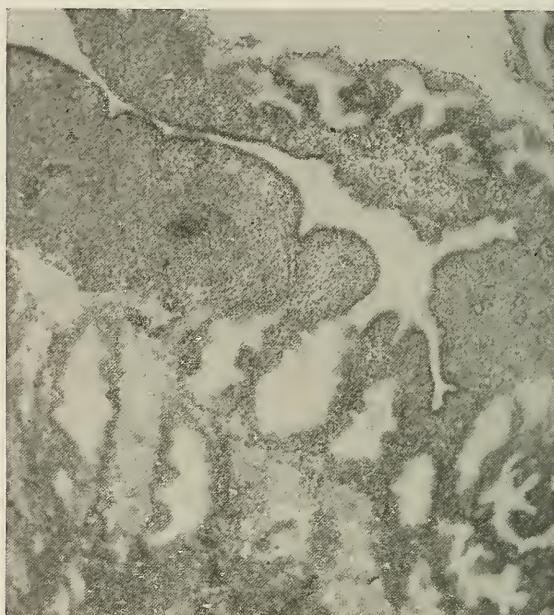
A section of a cervical polyp that shows gland proliferation with cystic development. The round-cell infiltration indicates an inflammatory origin. There are none of the marks of malignancy.



This section shows in detail the gland structure found in a cervical polyp. The glands are somewhat cystic. The cylindrical cells lining the cavities are uniform, with no abnormal heaping and with intact basement membrane. The apparent piling of the cells in one cavity is due to the fact that connection with the larger cyst is at an acute angle, so that the cells have been sectioned transversely.

hand has been too well emphasized in all text-books to require enlargement here. The continual recurrence of reports of perforated uteri in careless hands, and even occasionally by skilled operators, ought to be sufficient to emphasize the great importance of doing such work with the greatest delicacy.

For the purpose of washing out the debris, the irrigation of the uterus following the scraping has nothing to condemn it, provided



Section of tissue removed by curette for diagnosis. This is the character of tissue most commonly taken for malignancy. The apparent irregularity of the lumen is not due to a heaping up of epithelial cells, but to an irregular proliferation of the stroma between the glands. The condition is the result of an inflammatory process.

we bear in mind the ease with which any solution under pressure may be forced through the tubes into the abdomen, and provided our asepsis is perfect. The more usual procedure of applying tincture of iodine, carbolic and alcohol, or other antiseptic or caustic, may be wise if we suspect an infection, but can hardly be advocated as essential, or even of value, in clean cases, in the light of our present knowledge of endometritis and our methods of asepsis.

If we are certain that the cavity is clean and smooth, that the drainage will not be disturbed by our other operative procedures, and that our asepsis is good, there is not much to be accomplished by one internal application to the uterine cavity.



This higher magnification of the preceding section shows that the epithelium lining the gland lumen is regular, with the basement membrane intact—findings which speak against a malignant growth.

## CERVIX OPERATIONS

**O**F THE plastic operations in the pelvis, none have reached a greater degree of simplicity in the number of procedures than those upon the cervix. Since the paper of Emmet, in 1874, first emphasized the fact that so many supposed ulcerations were but the exposure of the mucous membrane as a result of injury, and suggested the method he practiced for correction, practically no change has taken place in the operation for repair. Tait said of the Emmet trachelorrhaphy that "we can't modify the operation; we can't change it, for it is perfect—perfect in its method, and perfect in its results."

In this monograph, which deals mainly with the injuries of parturition and the resulting inflammations, I shall consider in detail only the so-called low amputation and the Emmet repair.

The high amputation, which means the cervix removal at or above the vaginal junction, and which depends upon the vaginal mucosa for the covering of the uterine stump, has no place in minor surgery. The consensus of opinion is that this operation is often attended by more shock than even a hysterectomy. It is not the operation of choice in a malignant condition of the cervix, unless we are absolutely certain that the growth is only superficial. Any question of a more than superficial involvement demands a hysterectomy as a necessary precaution. If for any reason a hysterectomy is refused or is impossible, the growth destruction by the actual cautery is more desirable than cutting into a malignant cervix and thus opening up fresh channels for the cancer-cell reinoculation. I am inclined to think that in the very early stages of epithelioma, and possibly in some other cervical conditions, the use of the carbon-dioxide freezing may offer just as satisfactory results as it does in epithelioma and other growth formations of the skin.

Outside of conditions of malignancy, there is practically no pathology necessitating the high amputation. The low amputation, on

account of the removal of a certain amount of tissue as well as by the favorable retrograde process started, takes care of even an excessively large cervix, so that little is gained by the high operation. If there is any occasion for choice, the consideration should lie between a hysterectomy and the high amputation rather than between the high and the low amputations.

There has been much discussion, especially in the German literature, of the effect of the high cervical amputation on pregnancy, and the opinions have been fairly evenly divided as to the possi-



An irregularly lacerated cervix. Both lips  
are markedly hypertrophied.

bility of a fibrous ring resulting that would interfere seriously with labor. Some contend that their experience has shown a rapid ending of the first stage in the majority of cases. On the other hand, the tabulated results of cases reported seem to show a much greater increase in the tendency to abortion as well as a marked reduction in fertility—after-effects not found in trachelorrhaphy or the low amputation. Again, at operation severe secondary hemorrhage occurs in over five per cent of the cases.

The simple repair of the cervix was designed by Emmet when he had his attention drawn to the true pathology back of the so-called "ulceration of the cervix." He showed that this supposed ulcer-

tion was in reality the turning out of the normal lining of the cervical canal, as a result of lateral tears at childbirth. The healing, taking place by the formation of granulations, deposited scar tissue in the angles. Superimposed on that came the erosions and resulting inflammation, as the consequence of circulatory disturbance and friction. In order to correct this condition, he removed a wedge-shaped segment of tissue from each angle that marked the site of the original injury, but left the canal untouched. He then approximated the raw areas. Thus, practically, he reproduced the original injury and turned back into the canal what was the normal lining.

The best way to judge the extent of the denudation required is to grasp each lip of the cervix with a single hook or a vulsellum forceps and hold them together. One will then readily see the amount of tissue requiring removal from the angles. The area is outlined by an incision, and at the same time the width of the cervical canal is marked off. The denudation within these lines is, as a rule, more readily done by making first a lateral incision on each side in the angle deep enough to reach below the scar tissue. The sides of both lips are then denuded with knife or scissors, as is most convenient, keeping well beneath the scar formation, since it is important that all the scar tissue should be removed, as that is largely the basis for the pathology.

Each angle is united by three or more interrupted sutures. The first suture is inserted at a point about an eighth of an inch outside the denuded area in the vaginal portion of the ventral lip on the patient's right side. It passes under the raw area at right angles to the canal, exiting at the edge of the undenuded cervical strip. It is then reinserted at a corresponding point on the undenuded portion of the dorsal lip, passing beneath the raw area again at right angles to the canal to exit at a point corresponding to the starting-point on the vaginal mucous membrane. This suture must be placed well in the depth of the angle, in order to prevent a gap and control the bleeding. About a quarter of an inch externally, the second suture is placed in the same manner, and so the third, and, if necessary, a fourth. The procedure is repeated on the patient's left side, the sutures being inserted from right to left on the dorsal lip and

from left to right on the ventral; such placing of the sutures brings the knots on the vaginal surface.

Usually, the six or eight sutures are inserted before any are tied, though if bleeding is profuse the placing and tying of the first on each side will control that and permit better vision while the other sutures are being placed. Before tying any sutures it is important to make sure that there are no blood-clots left in the angles to prevent primary union.

When the sutures are all placed and tied, the cervix should present a normal contour with a single line of approximation extending out on either side of the os, running over the summit to the base in the median line.

Some operators prefer to remove the strip of tissue in each angle in one wedge-shaped piece without making any transverse incision. Left-handed operators, or even some right-handed operators, may prefer to apply the sutures in the reverse order by starting the stitch on the right side on the ventral lip, on the left side on the dorsal. The main factors to be borne in mind are the necessity for the complete removal of scar tissue, and the application of the sutures so as to place the knots on the vaginal side of the cervix.

This operation on the cervix, when thoroughly understood, is not one which can be considered difficult, and yet, to get good results, it is essential that it should be done with care. The number of cases that one sees in which broad or irregular scars are found following trachelorrhaphy is surprising. Sinus formations between the sutured points are also frequent. Both these defects, on account of the remaining irritation, continue the development of the cyst formation, and therefore necessitate a secondary plastic operation.

The difference in the value between trachelorrhaphy and the low amputation is one wholly of the amount of tissue removed. Of the low amputation there are several types, all, however, having as their purpose the removal of a certain amount of tissue from the ventral or dorsal lip, or both, as well as the scar tissue in the angles, and at the same time the preserving of a patent canal.

It is much easier to obtain a good-looking result from the flap type of operation devised by Schroeder than from the "cone and mantle" operation of Simon. It is by no means easy to judge the

size of the canal flap, or so-called cone, in relation to the portion of the cervix removed. If the cone is too large, it will later protrude and give a margin of everted mucous membrane surrounding the os when the remainder of the cervix has undergone its normal involution. The Simon operation is also advisable only when the cervical canal mucous membrane is healthy and the cervix itself is thick and hard.

The simplest operation, and the one giving the best cosmetic results, and best adapted where only a moderate amount of tissue removal is required, consists first of two lateral incisions carried well below the scar tissue in the angles. Then, with a knife, or often better with the scissors, as much as seems desirable of the upper portion of the ventral and dorsal lips is removed, but at least enough to get below the everted mucous membrane and the cyst formation. If this section of the cervical lip is extensive, it is well to make either the incision somewhat wedge-shaped or to undermine slightly the vaginal mucosa, in order to approximate more easily the cervical and vaginal mucous membranes. This approximation is done with two interrupted sutures about the width of the canal apart, care being taken when passing the needle through the cervical mucosa to go deep enough to include some muscle tissue and thus avoid the tearing out of the suture when tying. In all cervical work the general surgical principle of working from below up, so that the blood will not unnecessarily obscure the field, should be observed.

Having obliterated by the sutures both the denuded areas on the lips, it is then possible to determine the amount of tissue that it is necessary to remove from the angles of the cervix in order to get rid of the scar tissue and obtain an even and accurate approximation. This removal is done just as in the ordinary repair. Three or four sutures on each side, placed in the same way as in trachelorrhaphy, complete the operation. The bleeding may be rather profuse at first, especially if the tissue removal is extensive. As a rule, this bleeding is readily controlled by the first sutures applied. If, however, it comes from a vessel in the exposed lateral areas, a hemostat can be applied until it is time to place the first sutures in the angles. With these properly placed and tied, there

is no further trouble and no necessity of ligating any individual vessel.

It is well in all operations on the cervix to use chromic gut, for even as late as the tenth day secondary bleeding has been frequently reported, probably as a result of the too early disappearance of the suture material. As most of these cases are associated with perineal repair, it is wiser to use absorbable sutures, and thus avoid the early stretching of the perineum necessary for the removal of non-absorbable material. It is wise, also, to place a loose wick of gauze within the cervical canal in all cases of amputation, in order to prevent the gluing together of the lips and the interference with drainage. If this gauze is left sufficiently long to protrude from the vagina, or a ligature is tied to it for the same purpose, the gauze can be readily removed by the nurse at the end of thirty-six or forty-eight hours.

In the Simon operation an attempt is made to remove in one section a wedge-shaped piece extending across the whole width of the cervical lip, usually after the primary lateral incisions have been made. It is then necessary to form on the inner surface of the wedge a flap of mucous membrane for the cervical canal. Here it is that the difficulty is presented of judging the amount of tissue to be removed and the shape of the wedge, so as to obtain a nice adjustment without a redundancy of the canal mucous membrane.

Schroeder's single-flap method modifies the operation by making an incision at right angles to the cervical canal across both lips, separated by the first incisions, to a depth sufficient to get below the cystic portion, and then removing a section of tissue at that depth across the whole cervix parallel to the cervical canal. This procedure makes a somewhat thinner flap of the lips, so that they can be folded upon themselves in approximating the mucous edges. In both modifications the suturing is identical.

In all cervical operations the first essential is to leave a cervical canal as normal as possible. In order to do this and prevent a complete closure, it is necessary to leave on at least one lip a sufficient amount of undenuded mucous membrane. It is important to make sure that the canal is sufficiently patulous at the os, so that the caliber is the same, or at least not greater, within the cervix. If the

reverse is true, normal drainage is interfered with and future possibilities for trouble offered.

Every text-book of gynecology contains detailed descriptions, with illustrations, of the cervical operations, at least those advocated by the individual writers, and it is not the purpose of this chapter to repeat what is already in every doctor's library, but rather to emphasize the procedures which are most applicable, especially from the standpoint of the details that experience has made pertinent.

## SYMPTOMS AND DIAGNOSIS OF THE RELAXED VAGINAL OUTLET

THE diagnosis of a relaxation of the vaginal outlet ought to present no difficulty. The reason that so many of these conditions are neglected is probably due not so much to the lack of recognition of the injury as it is to a poor appreciation of the importance of correct support to the woman's health. A history of the character of the labors with a review of the present symptoms will almost always direct attention to the possibilities, and a careful examination will readily confirm what we suspect. In making this examination, however, it is important to use an examining-table instead of a lounge or bed, for the posture of the patient may obscure the gravity of some of the pathology.

By noting the changes from the normal in the vulva, such as the increase of distance between the vestibule and anus, the flattened appearance of all the parts in contrast to the contour of an uninjured outlet, with the thinning out of the perineal body itself, the diagnosis is possible. If, with these, the cystocele and rectocele protrude, there can be no doubt of the condition. However, one of the simplest and best methods of judging the degree of relaxation is to ask the patient to bear down. This forcing down of the pelvic contents in cases with no diaphragm support causes a rolling-out of the vaginal septa and a reproduction in a more marked degree of the condition that is present when the patient is standing. Especially is this procedure valuable in cases where the diaphragm is injured but the central tendon remains fairly intact, for in such cases the outward signs are often not marked. It is surprising sometimes to find to what a degree the cystocele and rectocele will protrude, when on simple inspection their existence may have been doubted.

Again, with the finger, or better both index fingers, inserted in the vagina and pressure exerted downward, in the lateral aspects of the canal, we can readily judge of the degree of relaxation,

and with more gentle pressure can palpate the location of the injury.

The third method of judging the degree of laxity is to request the patient to contract the pelvic diaphragm; with the finger in the vagina against the perineum, we can readily determine the amount of muscle tissue still functioning. In a marked relaxation,

what the patient accomplishes by this procedure is the contraction of the fibers behind the rectum. This brings the structures ventral to the levator ani forward as a whole, instead of contracting the perineum directly beneath the fingers. In a normal individual this demonstration will readily show the distribution of the levator-anus muscle.

These three methods are not only useful in making a diagnosis of the degree of relaxation, but will give us an idea of the value of our repair work when the patient returns later for examination. When the operation is completed, and before the patient leaves the table, it is easy by palpation to demon-



This patient submitted to a trachelorrhaphy and perineorrhaphy two years ago. From external appearance, the results are good, but careful examination shows that the diaphragm offers no support. The illustrations that follow show the degree of relaxation and the methods used in determining the value of the support.

strate the correctness of the work done. If by chance the patient happens to vomit or cough, we are given an interesting demonstration of the value of our diaphragm repair. If perfect, then the contraction of the muscle pulls up the dorsal vaginal wall snugly against the ventral and prevents the rolling-out of the structures that took place before. Of course, there is always a transmission of the pressure impulse from above, which causes a protrusion of the

soft parts as a whole, but the replaced muscle closes the vagina and prevents any protrusion of the septa beyond the body line. If any does take place, it speaks for a poor repair, which, by just such impulses, is gradually stretched out later on.

While examining a patient with a relaxed vaginal outlet, it is wise to grasp the cervix with a vulsellum and make traction downward, for thus we are enabled to judge more readily of the level at which the cervix lies and can better determine the amount of support necessary in the ventral and dorsal vaginal walls. This procedure also enables us to estimate the shape and size of the uterus and its exact position, thus doing away with the use of a uterine sound. As an instrument for diagnosing the position or the size of the uterus, the intrauterine sound should have no place in any physician's hands, and the more the instrument is used the poorer gynecologists we can acknowledge ourselves to be.

There is probably no physical defect that gives such variety in its symptomatology as does the relaxed vaginal outlet with its resulting pathology. It not only produces local symptoms depending directly upon the character of the pathology present, but, by its undermining of the equilibrium of the nervous system, can account for almost any type of nervous phenomena. In fact, there are few abnormal conditions of the body that have greater disturbing influences on the nervous system, especially when we consider that the abnormality is of the type of pathology



A separation of the labia shows the prominence of the ventral vaginal wall with a portion of the rectocele. In this case the greatest injury to the diaphragm is in the left sulcus. Evidently no attempt was made to approximate the diaphragm at time of the perineorrhaphy, as judged by the degree of levator-ani retraction.

that is not dangerous to life. Moreover, these general symptoms are often associated with only mild, or even overlooked, local discomfort.

For example, in the case of Mrs. S., aged forty-five years, the following history is characteristic. She is the mother of two children, the younger being eighteen years of age, both born under



This illustrates one method of determining the degree of relaxation of the outlet. The finger demonstrates by palpation the location and the degree of injury to the pelvic diaphragm. In this patient an Emmet perineorrhaphy was performed, judging by the character of the scar.

normal conditions, with no injuries reported. For three years following the birth of the last child the patient complained of symptoms, the result of pelvic congestion—backache and leucorrhea, with increased menstrual flow—but these ills disappeared under local treatment by the family physician. Some months later she began to have distressing headaches, referred to as "sick headaches," which, on account of the severe nausea and vomiting, produced marked prostration. Being incapacitated for two to three days each week, she had despaired of obtaining permanent relief. Thorough physical examination disclosed no abnormal condition outside of the pelvis, and there a moderate degree of perineal relaxation and cervical congestion. The pelvic condition was associated with such slight local symptoms that only careful questioning brought to light the existence of some bladder irritation. The degree of relaxation, though easily demonstrable, had been previously overlooked. In this case the correction of the pelvic pathology was followed by the prompt disappearance of the headaches, and the last seven years has proven the permanency of the cure.

Again, Mrs. B., aged thirty-five years, has had one child, born with instrumental delivery. Some months after the birth of this child, the patient's eyes began to give trouble. Frequent change of glasses brought only temporary relief. The pelvis gave no symptoms, and visits to two physicians in the hope of discovering a reason for the relative sterility resulted in the assurance that everything was normal. This patient was referred by an oculist, who reported the eyes without defect except for muscular irritability, and suspected a pelvic abnormality. The patient complained of no pelvic symptoms, and felt confident the trouble was not there. An examination, however, revealed a marked degree of perineal relaxation, with a prominent cystocele, of which the patient acknowledged being conscious when standing, but considered it a normal sequence of her pregnancy. The correction of this pathology resulted in the complete restoration of the eyes.

In these two cases we have a good example of the remote symptoms of pelvic pathology; but in the vast majority of cases these remote symptoms are associated with very definite local conditions that should at once attract the physician's attention. In some naturally neurotic women the nervous manifestations may take even a more severe form than eye-strain from muscle-weariness or the various types of headache, so that mental states such as melancholia or hysteria are by no means uncommon. It is not safe, however, to let one's enthusiasm, which is a natural sequence of results from correct perineal work, prevent one from



The patient being asked to bear down, a marked rolling out of the vaginal walls takes place. This method of demonstrating the relaxation also conveys an idea as to the condition of the sagging when the woman is standing.

remembering that, even though a relaxed vaginal outlet is present, there may be other causes for some of the symptoms. It is natural for one to be very sanguine of the results from correct pelvic plastic work, for there is no other field in surgery involving only external structures that gives as good and as uniform results in health improvement.

The local symptoms are either the result of the accompanying congestion or are due to the interference of the function of the adjacent organs, on account of the break in the pelvic diaphragm.

Probably the most frequent complaint, especially in the severer types of injury, is the feeling of lack of support, or, as the patient puts it, a feeling that "things are going to drop." This is, of course, more noticeable when standing or walking, and when seated these patients usually get more comfort with the knees crossed, on account of the support given by the thighs.

Backache, though a very frequent symptom, is by no means always present, and I believe it is more common in cases associated with the early grades of uterine and ovarian displacement. As the organs drop lower in the pelvis, it is not unusual to find no mention of backache, even in some severe degrees of procidentia. The backache that is due to a loose sacroiliac joint, while differing in location and character, is so often found in women who have borne children that it is very often confounded with the reflex ache of pelvic pathology. Only lack of thoroughness in examination, however, can account for the conflict.

Postural backache and the sideache and backache of kidney ptosis are frequently present in women, but usually respond to correct corset support and heel adjustment. The too popular tendency to lay stress on the pelvic congestion as a cause of reflex backache should always be combated and care taken to eliminate all other possibilities before assigning the pelvic injuries as the cause, or we may find ourselves and the patient disappointed by the persistence of the ache after the operative work.

The symptoms that are the result of the pelvic congestion are directly traceable to the associated pathology in the cervix, and these (the leucorrhea, with the increased or irregular menstrual flow) have been considered under that head.

The majority of women with relaxed vaginal outlets suffer from various disturbances of the bladder function. Frequently it is the inability to control the sphincter muscle when the bladder becomes somewhat distended, necessitating an immediate evacuation. This condition is present, as a rule, only in the daytime or as soon as the woman arises in the morning, and the ability to retain more readily the urine at night speaks against bladder inflammation, though in time that is often associated. These patients will usually tell you how they always have to plan to find a toilet convenient after a drive or street-car ride, and must find opportunity for rather frequent evacuation. This is often associated with an inability to control urine leakage on excretion or when coughing or sneezing. Such are the bladder symptoms complained of in the early stages of relaxation.

When a cystocele has developed, the inability to empty the bladder completely on account of the sagging adds a new type of symptom. Often it is the consciousness that the bladder is not empty, and the resulting mental distress added to a usually irritable sphincter increases the frequency of micturition, especially when arising in the morning or after physical and mental overexertion. When infection is superimposed, the frequency is increased; burning during urination and pain after are then present. The rectal symptoms, as a rule, occur earlier than those of the bladder, but, as the bladder is called to the attention more through its frequent function, the rectal symptoms are more often overlooked. The earliest indication, as a rule, is constipation, a constipation that is due to a lack of perfect control of the lower rectum rather than to any change in the peristaltic waves higher up. This lack of expulsive power is, of course, the result of the stretching out of the ventral rectal wall and the retraction of the sphincter ani, due to the destruction of the perineal anchorage. While the desire for evacuation is present, the expulsive power is wanting, and in some cases it is necessary to support the rectocele in order to accomplish the emptying of the bowels. Interference with the bowel action low down soon has a direct reflex effect higher up, and a chronic persistent constipation results.

On account of the sagging interfering with the return circula-

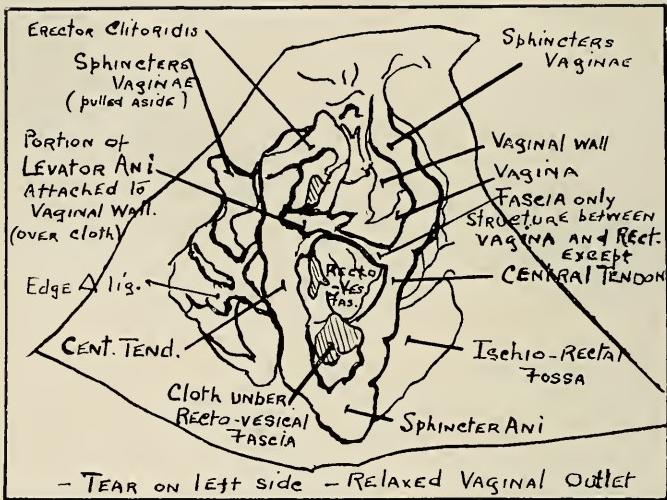
tion from the rectum, associated with a more or less spasmoid sphincter muscle, the formation of hemorrhoids, especially of the external type, is very frequent. The lack of tone in the stretched-out rectal wall, the pressure above from the enlarged cervix and the often low uterine body, with the pressure of the bowel contents, produce the congestion. In fact, the presence of hemorrhoids in women who have had children is exceedingly suggestive of a relaxed vaginal outlet as a cause. A large pelvic tumor is often associated with hemorrhoids, but the simple retroversions uncomplicated by an injured perineum are not nearly as frequently the cause of hemorrhoids as supposed.

A woman with a marked degree of relaxation will sometimes complain of the audible expulsion of air from the vaginal canal, though often imagining that it comes from the lower bowel, due to poor control of the sphincter.

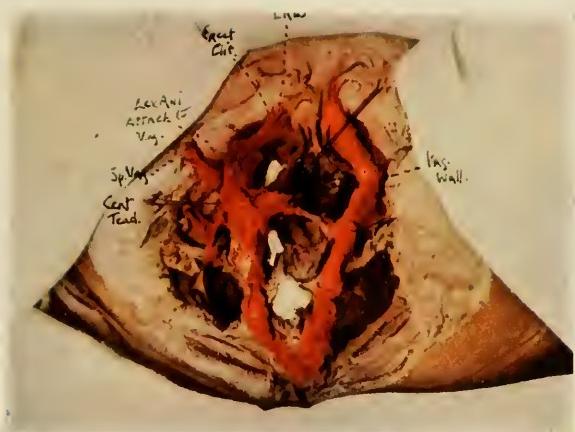
The permanent patulous condition of the vaginal canal permits the ready ingress of air when the patient gets into a position approaching the knee-chest or Sims's lateral posture. The value of these two positions for examination purposes depends on the air distention of the vagina. Through the gravitation of the abdominal and pelvic organs toward the thoracic diaphragm by the patient's posture, the ballooning out of the canal occurs, thus permitting unobstructed inspection. In order that this may be accomplished in an uninjured outlet, it is necessary to retract the perineum so as to permit the air to enter. In fact, the knee-chest posture as a therapeutic procedure is of little value unless the patient is directed to permit the entrance of air by retracting the perineum. With a relaxed outlet a far less exaggerated position than the typical knee-chest or Sims's allows the air to enter, and a change of posture as readily causes its expulsion.

PLATE IX

DISSECTION OF A RELAXED VAGINAL OUTLET  
TO SHOW THE RETRACTION OF THE  
LEVATOR-ANI MUSCLE



This subject had a relaxed vaginal outlet. The central tendon has been cut through and pulled aside, thus distorting the superficial structures, in order to show the absence of the levator-anus muscle between the vagina and rectum, the only tissue intervening between these canals being a layer of fascia. The levator-anus fibers are shown retracted to the attachment of that muscle to the vagina. Beneath this portion of the muscle a strip of white cloth has been placed, in order to show the size and relation of the middle segment of the levator ani.





## PERINEORRHAPHY

**F**OR a correct repair of the relaxed vaginal outlet a thorough knowledge of the normal perineum is essential, and with such knowledge any of the advocated repairs can be made successful, no matter what the form of denudation or the method of suture. Gynecological literature is continually suggesting new varieties of perineal operations; and yet, when everything is considered, practically the only advance of recent years worth marked notice is that of the differentiation and direct union of the separate structures to be united. With this statement we record the only vital difference between the flap-splitting operation, the outgrowth of the original Tait, which was exceedingly superficial, and the popular operation of today, credited under the names of various operators. All other variations are simply methods of suture application or structure separation. The variety of suture or the method of its application will always be a matter of the operator's personal preference. Again, the extensive dissection, with the separation of tissue, no matter how accomplished, is contrary to the normal anatomical relation, and favors some complications. To produce a correctly functioning perineum, it is essential to accomplish not only a union of the pelvic floor, but of the pelvic diaphragm as well.

Wells in a recent paper gives the following steps as necessary to get perfect results in any perineal repair, and advises the flap-splitting method as the best to accomplish the result:

"First, the union of the fibers of the levator-ani muscle with their proper perineal attachment; second, the restoration of the fascial covering of this muscle; third, the union of the two layers of fascia, the pelvic and perineal, at their points of mutual attachment, namely, in the center of the perineum; fourth, the restoration of the action of the transversus-perinei muscles, which have hitherto drawn upon the severed fibers of the levator-ani muscle in a lateral direction, flattening the caliber of the vagina and causing it to gape."

Theoretically, this advice is excellent. Practically, even in the hands of the expert, its accomplishment in every case is exceedingly problematic. In many cases of dissection in the anatomical laboratory it is impossible to separate to one's satisfaction the layers of fascia entering into the construction of the pelvic diaphragm from the muscle itself, on account of the close blending. What cannot be done under conditions entirely favorable to its accomplishment can hardly be possible in the operating-room. Moreover, in the injured perineum the distortion, on account of the muscle retraction and the scar-tissue formation, further complicates the separation. No matter what the distortion or how great the muscle separation, it is always possible even without dissection in all forms of denudation to pick up the edges of the levator ani laterally at its middle segment for direct suture to the corresponding portion on the other side. The function of the vaginal sphincters is of just as much importance as the transversus perinei, but probably the first step, consisting of "the union of the levator-ani muscles with their proper perineal attachment," is intended to care for them.

Since the early days of gynecology there have been three types of operation, and upon these practically all our multitudinous modern operations are built, though too often the worthy pioneer loses the credit of the procedure by the addition of unessential variations.

These three classical operations which we should still do well to bear in mind are the Tait, the Emmet, and the Hegar.

First, we have Tait's method for the incomplete tear. The Tait, however, that is here described is the result of a gradual development of the originally described operation, which was exceedingly superficial. This consists of a linear incision carried along the mucocutaneous border from a point a half inch or less dorsal to the orifice of one gland of Bartholin to a corresponding point in relation to the other. This incision was carried beneath the mucous membrane or the scar tissue, and by a dissection separating the vaginal mucosa a flap was formed which was continued well out in the lateral aspects, exposing a broad area of perineal tissue beneath the imperforated mucous membrane. This flap-splitting

was carried up to a point above the pelvic diaphragm. The area of perineal structure exposed when the flap was elevated was then approximated from side to side. The sutures, if inserted deeply enough in the lateral tissues and made to exit in the median line before reinsertion on the opposite side, produced a flat approximation of tissue instead of a puckering-string effect. The first suture was placed dorsally in the denudation, the remaining sutures inserted at short distances apart from below upward, the last suture passing through the under surface of the flap in the depth of the wound so as to eliminate any dead space and anchor the mucous membrane. The portion of the flap which did not naturally recede within the vagina upon tying the sutures in the order inserted was stitched over with a superficial suture, to close any raw spaces.

Practically, the difference between this operation and our present-day flap-splitting is the difference between the older "through and through" closure of the abdominal wall and the more careful layer approximation of the present. But no one can deny the fact that the majority of closures by the old method were successful, even though we realize that the present method is more uniformly satisfactory.

For the complete tear of the perineum no scheme of incision and denudation, whether the flaps are left intact or removed, serves the purpose as ingeniously as the Tait. It differs from the operation for the incomplete injury, in that a line of incision is carried dorsally on either side of the rectovaginal cleft, starting at points that would be about the limits of the middle third of the original incision for incomplete repair. These dorsal incisions are carried far enough down to make the findings of the ends of the external sphincter ani easily accomplished. If we bear in mind that nearly always we have a superficial dimple formed where the ends of the torn muscle have become attached to the superficial structures, and that these landmarks are usually well defined, we shall have no difficulty in deciding the extent of the incisions.

Tait, writing in 1879, describes his operation for the complete injury as follows, though later descriptions by other men give somewhat different versions:

"In case of complete tear of the perineum, my method of operating is this: I make two incisions about one inch and a half long, just at the margin of the skin and mucous membrane, and marking the edges of the torn perineum. These will be more or less apart, according to the depth of the tear. They should be nearly parallel, but somewhat converging toward the coccyx. The knife is carried right through the skin down to the subjacent tissues, and the rest of the operation is done by strong, sharp-pointed scissors. These are introduced just under the skin at the upper end of each wound and run under the mucous membrane (cutting nothing else) about half an inch from each side inwards, meeting in the middle line, and forming a curve parallel with the margin of the torn septum. The lower lip of this wound is then seized by dissecting forceps and the mucous membrane carefully raised from the adjacent tissues as far as the edge of the rent, but not separated at that edge, so as to form a flap. This flap is turned downwards and backwards into the rectum. A stout curved needle armed with strong Chinese silk is then to be introduced about a quarter of an inch from the center of the skin wound on one side, and carefully carried through the tissues of the septum till its point is within a quarter of an inch of the middle line. The point is then to be brought out in front of the flap and passed into the septum again at about another quarter of an inch on the other side of the middle line, and is then to be continued till it comes out at a point corresponding to its original insertion. The whole success depends upon this stitch, so that the utmost care must be taken with it. Two other stitches are similarly introduced, one in front of, and the other behind, the first stitch, and all three must be in front of the flap."

In case this original Tait method will not apply, a modification may be readily devised, which will give a dorsal flap that may be turned into the rectum as its ventral wall, thus protecting the perineum from contamination.

In an extensive injury, where the defect in the ventral rectal wall is high, there is no mucocutaneous line as a guide for the first incision, and the location of that incision is a matter of judgment for each individual case. The flap, which is dissected upward and turned into the vagina as described, having to cover a much greater area in length, must consequently be of larger proportional size, though in the majority of cases the vaginal flap may be eliminated entirely, as in the Hegar denudation. The dorsal flap need be made

only of sufficient length to reach just beyond the point that will become the ventral edge of the anus when the sphincter muscle is sutured over the downwardly retracted membrane. This dorsal flap, as a rule, needs but slight dissection after the scar tissue has been cut through, for it will easily retract downward. With the rectal flap pulled down and the vaginal retracted upward, the resulting denuded area is closed from side to side in the same manner as in the incomplete operation, the sphincter ani having been first repaired by direct suture. Such an approximation adds to the length of the vaginal canal a distance equal to one-half the width of the denuded area, and the portions of the two flaps that are not used in forming the covering of this increased length of canal may be removed and the edges sutured. But, generally, the redundancy is slight, and the normal shrinkage will take care of the excess.

The dorsal incision of both the Hegar and Emmet incomplete operations follows the lines of the Tait along the mucocutaneous border. For the complete injury, lateral incisions toward the anus are added as the method of obtaining tissue for the ventral rectal wall and reaching the retracted sphincter ends. Thus in the dorsal aspect of the denuded area they do not differ either in the resulting line of union or suture application.

The completed Tait operation is represented by a linear line of



This patient serves as another illustration of poor diaphragm support following an imperfect perineorrhaphy. To casual observation the results seem good, though there is a small point of the rectocele visible. The distance from the posterior commissure to the anus is about normal, the contour of the parts being good. This is a result of a good approximation of the pelvic-floor structures.

union from the anus to the vaginal "posterior commissure" in the complete tear, with about the ventral half of that length in the incomplete tear, each line being approximated by transverse interrupted sutures. The other operations differ only in the internal vaginal aspect.

In the Hegar operation a point is selected on either side of the vaginal orifice sufficiently below the openings of the glands of Bartholin and in the line of the

"carunculae myrtiformes" so that when the points are approximated a vaginal canal entrance of normal dimensions is formed; for, on suture, these points come together in the new "posterior commissure." A third point is chosen on the dorsal vaginal wall in the median line, the height of this point depending on the amount of redundant vaginal mucous membrane and the extent of the rectocele, but it should be high enough to allow easy access to the pelvic diaphragm. These three points caught in forceps and retracted give a triangular area which is then outlined by incisions and the enclosed mucous membrane denuded.



The labia separated while the patient bears down shows the marked relaxation above the floor. The character of the scar would indicate either an Emmet or Hegar denudation. The tubercle of the vagina is somewhat prominent, but there is no evidence of cystocele upon further examination.

If the lateral lines of this triangle are made to diverge somewhat at the depths of the sulci which mark the line of cleavage in the injured pelvic diaphragm, it will be found easier to pick up the retracted muscle. Better support will be given to the ventral vaginal wall by the slightly greater area of denudation, but this slight modification simply helps in the approximation of individual

structures, and can hardly be considered as changing the character of the operation.

The original Hegar operation approximated this area of denudation from side to side with deeply inserted interrupted sutures. The more important sutures always exited in the median line be-



The points of forceps application indicate the angles of the Hegar demudation of the degree that is necessary in this case. The orifices of the glands of Bartholin are plainly evident.

fore reinsertion on the opposite side, in order to obtain a flat approximation, and also to prevent injury to the rectum.

The main advantages advocated for the Tait operation over the Hegar were, first, that in the Tait no injury existed within the vagina—a point of importance in the early-day surgery, but hardly of consequence with our modern asepsis; second, that the Tait sacrificed no tissue, and thus was more applicable to cases of extensive injury in which scar-tissue contractions had formed.

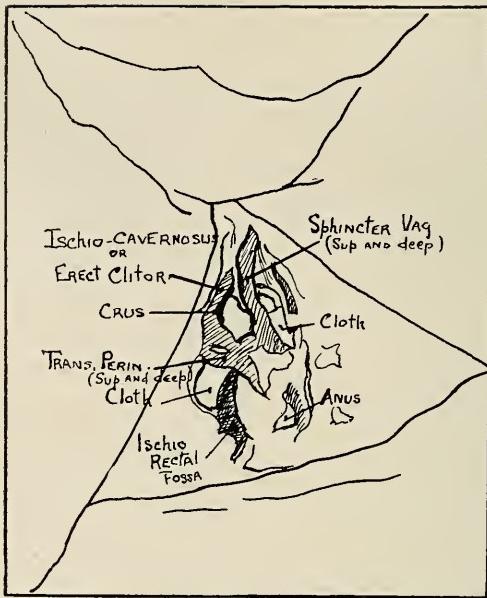
Emmet planned his operation to take better care of the lateral tear within the vagina which naturally involved the pelvic diaphragm. He probably figured that the highest point of the rectocele had primarily its normal attachment at the external orifice of the vagina, but on account of the injury had retracted upward, and his operation was devised so as to bring this point into apposition with the two lateral external angles of the denudation.

The area of denudation has been likened to an inverted "W," though also called the "butterfly" denudation. The outlines are best defined by taking five points of location: one on each side externally, corresponding to the lateral points in both the other types of operation; one on the crest of the rectocele in the median line, low enough to permit of retraction downward to the first points; and one on either side of the rectocele in the sulci, high enough to be above the injury of the diaphragm. These five points caught up with forceps and put on tension, and the lines of incision carried from one to the other, give a "W"-shaped area with the angles inside the vagina and the mucocutaneous line joining the main arms.

Emmet advised the removal of the mucous membrane in narrow strips by means of scissors, thereby conserving the fascia layer. This raw area is united by closing each angle as far as the rectocele tip with interrupted sutures, the remaining lozenge-shaped area being united from side to side in the same manner as in the other operations, with the exception of what was called the "crown" suture. The latter was inserted so as to give as broad an approximation as possible of the structures beneath the rectocele tip. In reality, upon the right application of this suture depended the correctness of the operation, and probably many critics failed in their results on account of misunderstanding this step. The suture should be introduced at the point of the lateral forceps, inserted parallel to the direction of the vaginal canal, exiting at the end of the lateral line of sutures already inserted, then brought across under the pulled-up rectocele tip, and from there applied to the opposite side in the same manner. This suture, when tied, pulls in not only all the structures blending into the central tendon, but also, if properly applied, the retracted levator-ani segment. Thus

PLATE X

THE MAIN MUSCLE STRUCTURES  
OF THE PELVIC FLOOR



Here an attempt is made to emphasize the main muscle structures of the pelvic floor. The separation of the superficial and deep muscles was not attempted, and probably some of the superficial fibers have been removed with the intervening fascia layers. The surgical interest being the purpose in mind, I have attempted to define and emphasize the main muscle structures in their relation to the central tendon and to one another.





is formed the "posterior commissure," and the remaining area united by deep sutures becomes the median-line skin apposition. The resulting line of union corresponds to the line of the "Y"-shaped injury previously described.

The operations of the present day employ in every case one of these classical denudations, with perhaps a slight modification to suit the individual surgeon or accommodate the character of the particular injury. The difference, as has been said, between the old and the new is that the surgeon now attempts to separate and define the various structures and unite them individually, and this he does by some preferred method of suture, each method of suture or slight modification of demidation going by a different name. A detailed consideration of these multitudinous methods is of no value, for if the principles involved are understood each operator will consider the individual case and apply thereto the methods best suited. A surgeon adopting one type of operation, and becoming expert therewith, can readily modify that type to fit the individual variations.

While a detailed consideration of the various modern operations will not be undertaken, there are phases of some methods which are worthy of consideration and study.

The operation which seems to find most favor at the present time is one probably first advocated, at least in some of its aspects, by Hall, of Cleveland, though Watkins, of Chicago, published a method almost identical about the same time. Their incision follows the mucocutaneous border around the dorsal edge of the vaginal canal. The dorsal vaginal mucous membrane is then dissected up, which often can most easily be done by means of scissors inserted under the membrane, then opened and withdrawn. When enough room is obtained, separation laterally is continued by the gauze-covered finger until a sufficient area for reaching the levator ani has been exposed. So far this differs in no way from the Tait incomplete perineorrhaphy. At this stage Morris, of New York, inserts the closed scissors in the plane of the pelvic diaphragm in an outward and ventral direction for a distance of about one inch; the blades then opened and withdrawn leave a space through which the levator ani can easily be reached. Hall picks up the levator without so

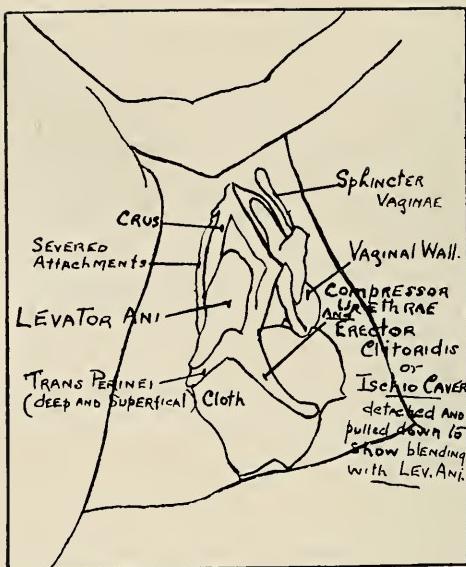
much tissue separation and dissects out carefully the muscle edges. The edges of the muscle are then picked up and united beneath the flap by several interrupted absorbable sutures. The first suture placed and tied is pulled downward, thus permitting a higher one to be readily applied. This draws in the tissues of the diaphragm toward the median line, and thus lifts up the dorsal vaginal wall so that it tends to close the vaginal canal. The pelvic-floor structures are then approximated beneath the diaphragm, and the skin incision is closed by some operators in the same direction as the incision was made. This method repairs the injuries to both the floor and the diaphragm, but does away with none of the mucous membrane, so that, for cases with much scar tissue and no redundancy of mucous membrane, it is ideal.

It is claimed by some of the advocates of this operation that the stab of the scissors goes under the fascia layer covering the levator ani, and thus permits the picking up of the muscle, but in the majority of cases the anal fascia is intimately interwoven with the muscle, and the separation is impossible. On this account the theoretical union of the muscle, followed by the reinforcement by the anal-fascia approximation, as suggested by Wells, is practically impossible of accomplishment. In reality, the scissors simply separates the normal attachment of the levator ani with its enclosing fasciae from the structures of the pelvic floor; it enters the lateral structures between the deep layer of the triangular ligament and the anal fascia. Whether such separation is of value is questionable, for it is not essential. By such separation we disturb not only the normal relations, but we interfere with the blood supply, especially the venous flow, which here, on account of the relaxed vaginal outlet, is often varicose, so that bleeding of a character hard to control and dangerous to the success of the operation may be encountered.

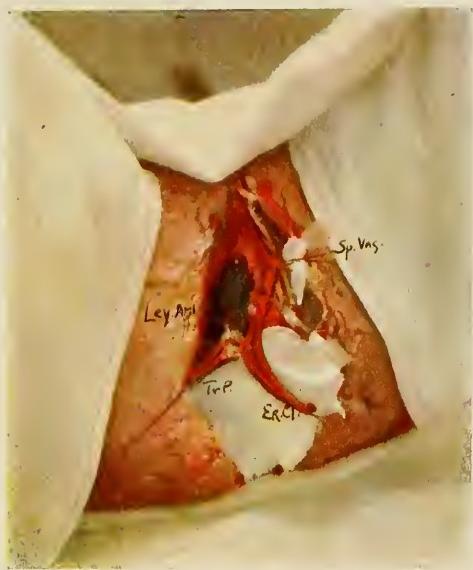
The portions of the levator ani thus united are called by most writers the pubococcygeus fibers. Anatomically, this designation refers to that portion of the muscle running from the bony attachment on the pubes to the tip and sides of the coccyx. If it is true that these are the fibers united, it naturally justifies the conclusion that they are pulled out of their normal course and made to ap-

PLATE XI

BLENDING OF THE LEVATOR-ANI MUSCLE  
WITH THE MUSCLES OF THE FLOOR  
AT THE CENTRAL TENDON



The purpose of this illustration is to show how the levator-anus muscle blends with the superficial muscles. No attempt was made to separate the superficial muscles of the floor from the deep muscles, but the fascia layers were removed between the individual muscle groups. These muscle groups, indicated by initials, are pulled aside, so as to emphasize the close blending of the attachments at the central-tendon area and the side of the vagina. This blending I wish to emphasize, since it shows that the scissors puncture in perineorrhaphy is not a necessary procedure in picking up the levator ani if the tear has extended through the central tendon. In this subject the muscles are well developed.





proximate ventral to the rectum as a support to the vagina. Such being so, it seems reasonable to suppose that the normal working of the muscle as an elevator of the rectum would be interfered with and the tendency to separation where united would be great. If we were dealing with the male pelvic diaphragm, such an operation would in reality unite the fibers normally passing to the outer



A relaxation of the vaginal outlet of moderate degree. In this case also the central tendon is only slightly injured. Abdominal work had been done in this patient, but the external plastic work had not been recognized as essential.

side of the rectum, for, if we can accept the anatomical descriptions as correct, there are no fibers running in front of the rectum. Pierson describes the male levator ani thus:

"From this long line of origin the fibers converge downward and medially to be inserted into the sides and tip of the coccyx, into a tendinous raphe extending in the median line between the tip of the coccyx and the anus and into the sides of the lower part

of the rectum. The fibers from the most anterior portion of the origin pass almost directly backward and downward to reach the sides of the rectum."

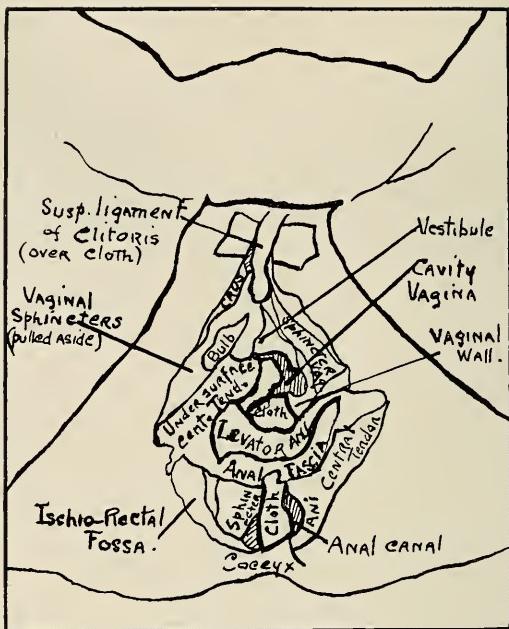
Consequently, in the male perineum the muscle edges exposed in such a method of dissection as that used in the repair of the female outlet would naturally be the pubococcygeus fibers, since the muscle is seldom in separate segments. In the female, however, as we have shown, there is a more or less distinct separation of the levator-ani muscle into segments. The segment running behind the rectum has no fibers from the pubic bone, as all these fibers have their origin in the dorsal portion of the "white line." The fibers arising from the pubic bone and the ventral segment of the "white line" run to the sides of the vagina and urethra, and between the vagina and rectum in usually two distinctly separated segments. Thus, it is the middle segments, or what corresponds to the middle segments if there is no distinct division, that are picked up and united beneath the vagina. In no way, then, is the rectal sling interfered with, as can readily be demonstrated by vaginal and rectal palpation.

The scissors puncture is not only unnecessary, but, as I have stated, may be injurious, for when the muscle is simply picked up with a vulsellum it comes readily into the median line and its relations to the pelvic floor and central tendon are not disturbed. This gives, I believe, a better and more normal support.

For a relaxed vaginal outlet in a case with only a moderate redundancy of the vaginal mucous membrane, the flap operations are without doubt the methods of choice. There is always a considerable gain in tone of the vaginal walls following a correct perineal operation, and where the relaxation is not extensive this improvement takes care of the excess. However, the majority of patients with an injured perineum, especially where the condition has been of long standing, have not only excessive relaxation of the dorsal vaginal walls, but also of the ventral, and this involves as well the fascia layers beneath the muscle tissue. There is no way of correcting either the mucous membrane or the fascia relaxation without eliminating some of the mucous membrane and building up the fascia layers beneath. This can be best accomplished by a denudation of the Hegar type, which is not limited in its area, as is the

PLATE XII

PORTION OF THE LEVATOR-ANI MUSCLE  
BETWEEN THE VAGINA AND  
THE RECTUM

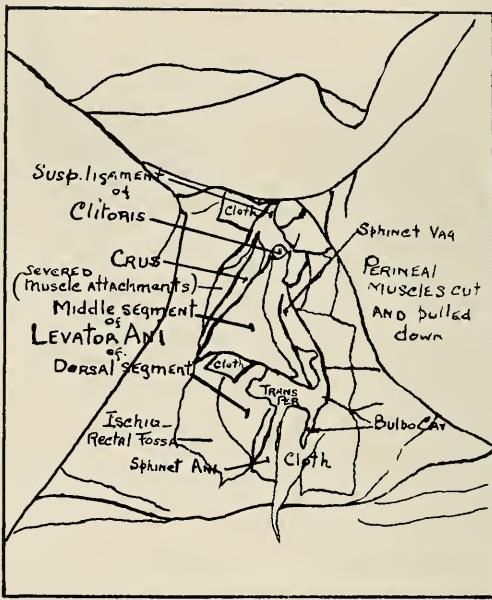


The central tendon is cut through and sewed to the side, in order to expose the levator ani and its fascia layer. The fascia layer has been partially separated and shows (uncolored) between the sling of the levator ani and the central tendon structures. A piece of cloth is placed beneath the portion of the levator ani that runs between the vagina and rectum. The blending of the deep ventral muscles of the floor with this segment of the levator ani is evident in this dissection.





PLATE XIII  
SHOWS THE INDIVIDUAL MIDDLE SEGMENT  
OF THE LEVATOR-ANI MUSCLE



The structures superficial to the levator-ani muscle are severed at their attachments to the pubic arch on the subject's right and pulled over to the left. This shows the middle segment of the levator-ani muscle as it passes cephalad to the right crus from its "white line" origin to its insertion into the side of the vagina and between the vagina and rectum. A piece of white cloth lies under its dorsal edge, in order to show that it is not only distinct, but that it overlaps the ventral portion of the dorsal segment. The structures running into the central tendon are pulled aside over the cloth, so that the blending of the dorsal segment of the levator-ani muscle with the central perineal tendon is shown at the line of demarcation between the muscle and tendon structures (colored red) and the uncolored levator ani.





Emmet, by the tip of the rectocele. While the Emmet reproduces the injury as it primarily existed and eliminates the scar-tissue formation which formed over the torn areas, it gives no opportunity to correct the excessive stretching of the vaginal fasciae that has taken place with the rectocele formation. It is important, I believe, to take cognizance of the fascia layers between the vagina and rectum above the pelvic diaphragm, even to the cervix if necessary, for by doing so we aid the function of the rectum through the return to usefulness of its muscle, which has often become more or less atrophic through stretching. The reefing, as it were, of this fascia gives the stretched-out muscle fibers of the rectum new points of attachment, and thus an opportunity to gain renewed activity. Not only is the support of value to the rectum, but also, by taking off some of the strain from the ventral colporrhaphy, is of direct value to the cystocele repair. In some cases of excessive redundancy, even where an excellent perineal support has been built by a flap operation, one finds the vaginal walls crowding downward and favoring a pouching of the rectum and bladder between the cervix and the pelvic diaphragm.

The main objection of many operators to the triangular denudation is the belief that the dorsal wall of the vaginal canal is considerably shortened, and a tendency to pull down the cervix and favor retroversion results. In reality, the length of the dorsal wall is increased to a marked degree. As the tissues are brought in from side to side, the apex of the denuded area recedes farther within the canal, and careful measurement will show half an inch or more of lengthening with improved lateral support along the whole vagina. It is essential, however, to pick up the fascia layers laterally well underneath the edge of the denudation, and not simply to unite the mucous membrane alone, if we expect to get proper support of the rectal canal.

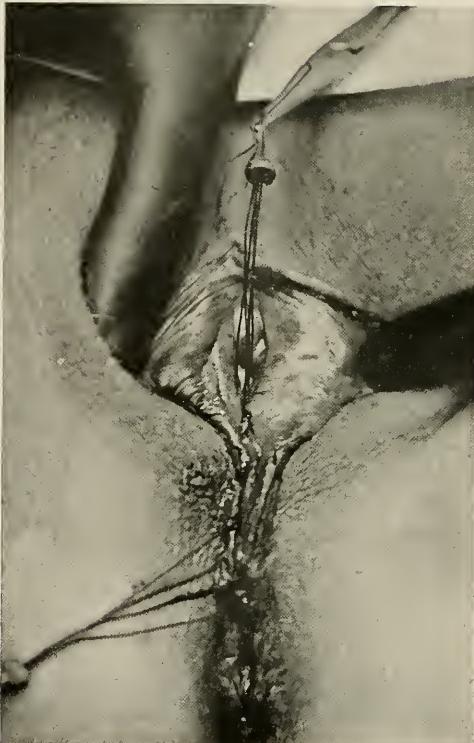
The claim for great advantage through having no incision line within the vagina, on account of its supposed aid to the better healing and the greater freedom from infection, has no basis. As the vaginal region is relatively resistant to infection, the ordinary aseptic care should eliminate the danger of outside contamination. In no case should a repair be undertaken if there is any danger of

infection by discharges from above. Outside of the conservation of tissue, the flap operation has no advantage over those in which the mucous membrane is removed.

The manner of suturing these various types of operation will

always largely depend upon the operator's preference. No matter whether an absorbable buried suture is used to approximate the various elements, or a non-absorbable one applied from the surface as a simple stitch or a figure-of-eight, the results will be satisfactory in the hands of the surgeon who understands the principles involved. The general preference is for the buried interrupted absorbable sutures to approximate the pelvic diaphragm and then the floor, and the whole reinforced externally by a few silkworm-gut sutures for lateral support.

For the average repair, my preference is for the Hegar denudation, the upper angle above the diaphragm being closed by interrupted catgut sutures uniting both mucous



The completed operation after a modified method of Somers. The four silkworm-gut sutures used in the approximation are clamped together with a shot. The ends distal to the shot will be removed. Note especially the absence of any constriction of tissue.

membrane and fascia. When the upper level of the levator ani is reached, continuous mattress sutures of silkworm gut are used to approximate first the levator-ani fibers and fascia, which structures are pulled well up in the field by vulsellum forceps; then the sutures are continued on through the central tendon. The first suture is placed in the depth of the denudation; it is carried from side to side at about the distance of a quarter of an inch from the median

line, and as it proceeds the tissues are carefully picked up so as to leave no retracted structures. When drawn taut the suture approximates the surfaces of the opposing areas traversed by the stitch. The second is placed in the same way just above and takes in more of the muscle tissue. These with the third suture, still more superficial, also passing through the diaphragm and central-tendon structures, build up a deep, firm perineal body. The fourth suture, wholly submucous and subcuticular, closes the superficial fascia with the mucous membrane of the vagina as well as the superficial portion of the central tendon and the skin. These sutures are not tied, for they remain in place by the friction of the tissues. The long ends within the vagina are gathered together in a perforated shot and the shot clamped some distance away from the mucous membrane. The same is done with the external ends, and the sutures are cut close to prevent irritation of the tissues by the suture ends. Both shot are left sufficiently far from the tissue line so as not to be buried if swelling occurs.

The number of sutures will, of course, depend on the size of the denuded area. The main advantage of the continuous suture is that in case swelling of the perineum takes place there is no tendency for the stitch to cut into the softened swollen tissue, for the long untied, smooth silkworm gut will accommodate the increased bulk. When the swelling subsides, the tissues retract along the sutures or can readily be pushed back. If, again, by any possibility infection occurs, as it occasionally will, the sutures act as excellent drains, and do not have to be removed until the process subsides. In fact, the continuous silkworm-gut suture may be the factor that will mean a good result, where with absorbable, or even non-absorbable, interrupted sutures a failure is inevitable. The presence of the shot and the length of the suture aid as well toward an easy removal.

The silkworm-gut sutures are left in place ten days; the inner ends are then cut close to the mucous membrane and drawn through one by one, the upper and the lower ones usually coming easily, but the two running through the muscle structure are often held by the voluntary contraction of the patient when tension is exerted. There is no need, however, of their immediate removal, for

as the patient is permitted to sit up the gut works loose and can be readily withdrawn in a few days.

If by any chance the suture has been locked upon itself during the insertion, the removal becomes impossible until the tissue grasped is cut through, which usually occurs after a little longer time than the ten-day period. Care, however, when the repair work is done, will readily prevent such an accident, for by pulling on the suture it is easy to see just how much tissue has been picked up in the preceding stitch on that side, thus avoiding the suture material in the next bite of tissue and the locking of the stitch.

The credit for this method of continuous mattress suture of non-absorbable material is due to Dr. George B. Somers, of San Francisco, who began its use prior to 1901. Since then several other operators have advocated a continuous mattress suture not differing very widely from Somers's method.

## CYSTOCELE

**T**HE rectocele is always cared for in the repair of the perineum, and does not have to be considered as an entity. The same is practically true of that complication sometimes found with the injured perineum, the rectovaginal fistula. Occasionally, a fistula of this kind comes from a pus-forming process opening into the vagina, but this is not common. The majority of such openings exist as the result of an improper healing of a complete injury at childbirth. A rectovaginal fistula has a greater power to heal spontaneously than has the vesicovaginal, on account of the character of the rectal contents; but, on the other hand, if extensive, it does not so well respond to operative repair. The majority of rectal fistulae are situated low down and usually just above the sphincter, so that the ordinary perineorrhaphy denudation covers the tract. A careful dissection of the sinus to the rectal wall, with its ligation or possible inversion, and a careful perineal approximation surmounting take care of the condition, and no further special operative plan is necessary.

When a fistula is situated high in the vagina, but too high for the carrying up of the perineorrhaphy incision, it is necessary to dissect out the tract from the vaginal wall, separating freely the vagina from the rectum, and then treating the sinus as a hernia sac, by ligation, avoiding the inclusion of the rectal mucosa. One ingenious operator suggests closing the edges of the dissected-out fistulous tract by a purse-string suture, the ends of which are then passed out through the sphincter by attaching to a curved forceps inserted from below, thus inverting the opening into the rectum. The reinforcing of the rectal muscularis and fascia, and above that the vaginal structure, practically assures a successful outcome.

The consideration of cystocele, both its causation and correction, is not a simple matter. As has been already shown in preceding chapters, a cystocele is only a small part of a general abnormality, and consequently can only be considered primarily from that view-

point. Yet there are some factors that place the anterior relaxations in a class more individual, and these factors depend upon the anatomical relations.

The ventral vaginal-wall relaxation, or so-called cystocele, is found in a variety of forms, and frequently much confusion arises in discussions which do not recognize these variations and the reasons therefor. Sooner or later all forms of relaxation develop into a condition of similar character, and most methods of repair deal with this final state. It is often unrecognized that one may find all the symptoms which can be credited to a cystocele occurring in an individual in whom there is no external protrusion, yet back of the vulva closure may be a marked bladder-sag, evidenced by cystoscopic examination and the finding of residual urine.

A cystocele may be of five types. The most conspicuous form, and one always separable into an individual classification, is the form that occurs with a uterine prolapse. Naturally, on account of the attachment of the bladder to the true cervix, a sagging of the uterus must always be accompanied by a descent of the bladder. Whether this protrusion will involve the whole urethra as well, depends on the degree of prolapse of the uterus and the extent of the levator-ani injury. If the segment of the levator ani running from the pubic bone to the sides of the vagina around the urethra and the fascia attachments of the urethra to the pubic arch are intact, the lower end of the urethra is held up under the arch and a sharp flexion is present in the canal. In such a case it is possible to demonstrate the muscle fibers throughout their course. If the fibrous attachment of the urethra to the arch has given way, the whole urethra will be prolapsed and the levator fibers will also be everted.

Cystocele with procidentia must be dealt with by methods best adapted to the correction of the procidentia, and consequently is beyond the scope of this article. The main causative factor here is not necessarily the condition found in other forms of cystocele, though they are likely to be associated, but it depends on the injury that has occurred to the uterine and vaginal supports at the cervical level.

Some men claim that cystocele is the cause of procidentia, and

that it is the weight of the bladder that pulls down the uterus. The reason the cystocele forms, they argue, is that, as a result of the stretching of the ventral vaginal wall and injury to the perineum, the bladder with its incompressible liquid contents produces a hernia of that viscus. Were a cystocele always the cause of procidentia, it would be reasonable to expect every extensive cystocele to be associated with prolapse of the uterus.

From the clinical aspect, it is evident that the number of cystocele cases are out of proportion to the procidentiae, and that many ventral-wall protrusions of long standing and excessive size are unassociated with any sag of the uterus. On the other hand, many cases with the uterus prolapsed to the vulva present no marked degree of cystocele.

Looking at the subject from the anatomical basis, it is easy to find a rational argument to explain the occurrence of a cystocele unassociated with prolapse.

From both standpoints, the clinical and the anatomical, it seems reasonable to account for uterine prolapse as a result of injury to structures at the cervical level. This has already been discussed.

Apart from the cystocele always associated with procidentia, there are four other forms of cystocele when classified according to their mechanical etiology. Naturally, these arbitrary varieties may be more or less associated either with one another or with procidentia.

The most common form is the one which results as the outcome of a general stretching of the fascia layers beneath the vaginal wall. It has been shown that these fasciae have their origin, or rather attachment, at the "white line," and that in normal individuals the layers are as firm as any abdominal layer and have, as well, considerable elastic tissue in their composition. The nearer to the "white line" our dissection is carried, the greater the reinforcement that takes place.

This general stretching will usually result from a too forcible forceps delivery or over-rapid distention after the child's head has left the uterine cavity.

The second variety, and one usually associated with the first, depends upon the injury of the levator-ani anterior segment, which

results in a protrusion of the lower portion of the ventral vaginal wall, and possibly is better designated as a urethrocele. A urethrocele, especially if associated with a relaxed vaginal outlet, soon permits the sagging of the upper ventral portion of the vaginal canal. If the outlet is not much relaxed, the protrusion acts as a wedge to widen that outlet. This wedge action is given by some men as the cause of a recurrence of the cystocele. The recurrence is not on account of the wedge itself, but is the result of the lack of attention to the levator fibers at the time of operation that permitted the persistence of the wedge.

The other two forms of cystocele are comparatively rare. In one class of cases a split in the fascia layers permits a true hernia of the bladder or the urethra, or of both, as can be evidenced by palpation of a hernia ring. In the other class the lateral vaginal supports have given way at their attachment along the "white line."

George R. White, of Savannah, in an article on cystocele has classified under three heads the generally accepted theories of bladder support and cystocele causation, though he believes that of these theories none are correct:

"1. Cystocele is due to overstretching and thinning out of the ventral vaginal wall and other supports of the bladder, which allow the bladder to descend in the form of a hernia. The condition is caused, or at least increased, by the relaxed perineum, which leaves the ventral vaginal wall unsupported.

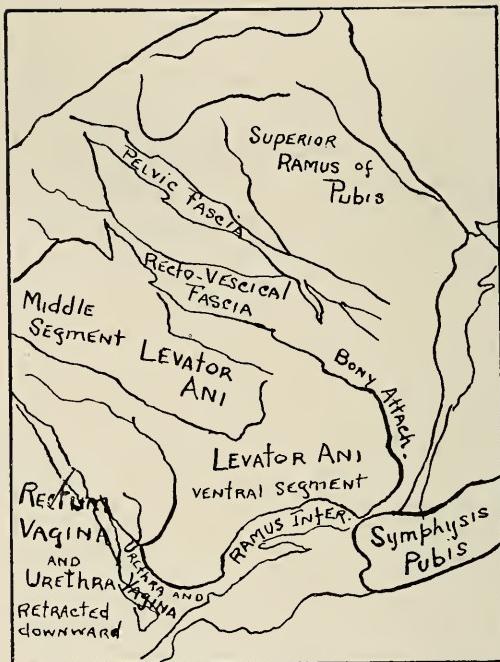
"2. The bladder is supported in part at least by its firm attachment to the uterus, and when this attachment is overstretched or broken during labor, or otherwise, the bladder descends as a cystocele.

"3. The bladder, like the stomach and other abdominal organs, is suspended by ligaments, which are attached below to a relatively inelastic portion of the bladder, and above along the obliterated hypogastric arteries and the uterus."

This classification expresses fairly well the varying opinions regarding the causation of cystocele. With none of these, however, does White agree, and his reason for believing that the cause of the ventral-wall relaxation is due to an injury along the "white line" is that in a repair done according to his method the vaginal wall

PLATE XIV

THE VENTRAL SEGMENT OF THE  
LEVATOR-ANI MUSCLE



A section through the pelvis at the symphysis pubis. The urethra, vagina, and rectum have been drawn downward; the layers of fascia covering the levator ani have been cut away to near their line of attachment at the "white line." The ventral segment of the levator ani, having its origin mainly from the pubic bone, is shown blending into the muscle structures of the pelvic floor and the sides of the urethra and vagina. The blue area represents the attachment at the "white line" of the middle and dorsal segments of the levator ani.





fits into the space originally occupied without redundancy and without the necessity for any resection.

To support this theory, he claims that thickening of the protruding structures takes place instead of thinning, as should occur with stretching, and further, that the perineal support as a prop to the ventral wall is disproved, because in complete rupture of the perineum cystocele is rare.

We have shown that the urethra is attached under the pubic arch by firm fascia bands; that between the vaginal mucous membrane and the urethra is a firm layer of fascia stretching across the pelvis from side to side. This fascia layer has its origin on each side at the pubic bone, along the "white line" and at the spine of the ischium, these attachments corresponding to the origin of the levator ani. The fascia layer beneath the dorsal vaginal wall has its origin along the same line, and thus reinforces the portion of this shelf at the sides of the vagina.

The first segment of the levator-ani muscle, which runs from the pubic bone to the sides of the urethra and vagina, is reinforced by the layers of the triangular ligament, and thus supports the lower portion of the ventral vaginal wall. These structures, with the attachment of the urethra to the under surface of the pubic arch, carry the weight ventral to the perineal body. The attachment of the bladder to the uterus aids in the support of the upper portion of the vaginal ventral wall. Between these two reinforced segments there is, in a normal individual, no other direct muscle support needed, for the middle and dorsal segments of the levator ani, running dorsal to the vagina, keep its two walls in close touch, and thus act as a support to this unreinforced section. The oblique direction of the vagina in the pelvis in relation to the center of gravity is what permits the levator ani to functionate in this way. Normally, the muscle structure of the vagina itself must also enter largely into the support of the fascia layers on account of its close blending to the fasciae and the presence of much elastic tissue.

In a cystocele that is not associated with a uterine displacement, and in which the lower portion of the urethra is in place, it is evident that the factor at fault is a stretched ventral wall, which, unsupported by the perineum, does not properly recuperate. In a

complete tear of the perineum the reason we do not always find a cystocele associated is that the force exerted during labor has expended itself in splitting the pelvic diaphragm dorsally, and the head consequently has not crowded down the upper vagina or excessively distended the canal. These cases, if left unrepaired a sufficient length of time, must result in a sag of the ventral wall sooner or later. Nor do they offer any proof against the value of the perineal support of the ventral vaginal wall.

The hypertrophy of the mucous membrane that always occurs in the first stage of cystocele and rectocele gives us no grounds for arguing against any stretching of the fasciae, for the thickening that results from the congestion, due to friction and exposure, is that of the mucous membrane alone. As the age of the patient advances, the normal atrophy of the mucous membrane supervenes, and the wall between the bladder and vaginal cavities becomes excessively thinned. In such a thin-walled cystocele, were we to follow a method of attaching the sides of the vagina to the "white line," as advocated by White and others, we should be depending on the weakest portion of our cystocele wall for the holding up of the bladder, and would be open to the same criticism that has been offered to the Emmet perineorrhaphy.

If we grant that a cystocele formation is due to a tearing at the "white line," we should expect to find in all cases a vagina in which the anterior column and the rugae of the mucous membrane are not obliterated or even smoothed out, or at least not until the weight of the bladder has produced an extensive protrusion, and then the attachment at the "white line" must necessarily be combined with a denudation method.

## CORRECTION OF CYSTOCELE

**I**T IS generally recognized, and, I think, with justice, that a mild degree of cystocele will be taken care of by a proper perineorrhaphy that builds up a firm perineal body, especially provided that the uterus is in position, or is so placed and kept. However, the presence of an enlarged sagging cervix, if left uncorrected, tends to bear down on the dorsal vaginal wall and disturb the perineal support of the ventral wall. This disturbance of the support, together with the tendency of the bladder to sag, on account of its close attachment to the cervix, favors the development of the cystocele, no matter how thoroughly the perineal repair is done.

If a separation of the attachment of the urethra to the pubes and the stretching of the ventral segment of the levator ani have occurred, and are not corrected, it is only to be expected that the urethrocele will grow and be followed by a cystocele, even with a perfect perineorrhaphy, since it is evident that the perineum offers no support to the vestibule, and the urethrocele acts as a wedge in dilating the vaginal outlet.

The patient who, in bearing down or straining, forces out the ventral vaginal wall requires some degree of correction of the redundancy. The greater the protrusion, the more extensive must be our bladder separation and support.

It is questionable whether at any time during labor a marked separation takes place at the attachment of the uterus to the bladder. For while this attachment is always loose and easily separated, no matter how severe the degree of cystocele or prolapse, the normal area of union is not lessened, nor are the ureters or their orifices distorted, as should occur with such an injury. Again, the cavity of the cystocele does not detract from the capacity of the bladder, but adds to its capacity that additional area. It is evident, then, when we consider these two facts, that the area which has gone into the formation of the cystocele cavity must have come as

a stretching of the vaginal and bladder walls. The stretching of the bladder wall has occurred at the expense of the sides of the bladder rather than the fundus, or base. An operation, then, which will separate the bladder from the vagina and so allow its contraction, and thus its better support, is most reasonable; but only in excessive relaxation does a complete separation from the uterus seem to be warranted.

The circular reefing stitch in the bladder itself after denudation, if used in a moderate degree, does not form an inverted cone within the bladder cavity, as so often stated by many men as their objection to that type of operation, but simply helps to give the circular muscle fibers of the bladder their normal points of attachment, with the proper limits of action, which thus develops their function. It is essential, however, to support this bladder-reefing by the fascia and vaginal-wall muscle reinforcement, and below that by the perineum.

A large cystocele denuded but unseparated laterally and inverted by a purse-string suture of broad area could readily raise the neck of the bladder relatively higher than the lateral sulci and shorten the ventral vaginal wall to an excessive degree. A correct support of the fascia layer below would eliminate these sulci, though a freeing of the bladder lateral to the cystocele area permits a more uniform collapse.

The types of operation advocated for the correction of cystocele are numerous, and each type has for its basis the purpose of correcting the etiological factor considered by the various advocates responsible for the occurrence of the protrusion.

The methods of operation are classifiable into seven varieties:

1. Those which are done through the abdomen, such as the separation of the bladder from the uterus, so as to approximate the base of the broad ligaments in front of the cervix as a support for the bladder. This same operation is done by Alexandroff and Tweedy through the vaginal route.

2. The numerous methods of operation advocated for the correction of procidentia, which condition naturally is always accompanied by cystocele and which places the cure of the cystocele wholly secondary to the procidentia. These methods come naturally

for discussion under the head of procidentia, though, as a rule, the operation must include some of the types of correction to be considered for the cure of cystocele.

3. The "interposition," or vaginal fixation operation, which with slight modification is credited to Mackenrodt, Wertheim, Schauta, Duhrssen, Watkins, and others. This method of cystocele treatment, even when the cystocele is unassociated with prolapse of the uterus, is of great value in cases of extensive grade or attenuated vaginal septa.

These three arbitrary groups are naturally beyond the scope of our work, and consequently will not be considered in detail.

Besides these, there are four methods which fall into the category of strictly plastic work:

1. Denudations done with scissors, and thus supposedly confined only to the mucous membrane, a point upon which some men lay great stress.

2. Denudations in which varying areas of the vagina are resected and in which the depth of tissue removal, short of injury to the bladder, is not considered of moment.

3. Denudations associated with separation of the bladder from the uterus and the vagina, the degree of dissection and the shape of the area denuded being differentiated by the names of the individual operators.

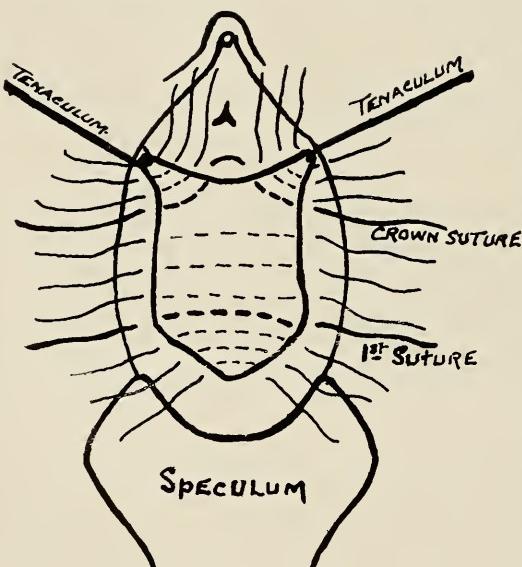
4. The vaginal operations which plan to correct the cystocele by incisions designed to reach the "white line" and attach the vagina thereto.

One cannot emphasize too often or too emphatically the truth that the correction of a cystocele goes hand in hand with the building up of a functioning perineum, and no matter what type of ventral colporrhaphy is decided upon it must be combined with the correction of whatever other pathology is present.

The operator who does the denudation with scissors, removing the mucous membrane in narrow strips, sacrifices no tissue except the mucous membrane, so that the basement membrane, the vaginal-muscle layer, and the fascia between the vagina and urinary tract are left intact, and in the approximation of the raw area all the support possible is given that can come from the reefing of

these structures. This is strongly recommended by Graves, who uses a somewhat hexagonal area of denudation, but with an angle running up on either side of the urinary meatus. This permits the use of a "crown" suture, which accomplishes the approximation of the ventral segment of the levator ani under the urethra. The illustration shows the method of applying the other sutures so as to accomplish the reefing of the raw area in a linear longitudinal direction beneath the urethra. Though not discussed by Graves from this standpoint, this method takes advantage of all the attenuated structures as well as the lateral edges of the fascia and the levator ani in correcting the redundancy, and on this account is one of the most rational denudation operations.

The second method, consisting of flap removal without wider dissection, includes practically all of the former types of ventral colporrhaphy, such as Sims's. These were classified as median, lateral, or bilateral. The shape of the area denuded varied according to the character of distention or the whim of the operator. The method of closure was either



The Cystocele Operation.  
Devised by Graves.

by purse-string, interrupted, or continuous suture, the only aim being the resection of the redundant tissue with approximation of the raw area.

The methods of flap removal with more or less lateral separation of structures are the operations receiving most support at the present time. The surgeon who feels that the separation or stretching of the attachment of the bladder and the uterus is at the foundation of the cystocele carries his dissection as high as, or even through, the peritoneal fold and elevates the loosened bladder upon

the ventral surface of the uterus. Sanger, of Leipzig, who was the first to report such flap-splitting, left the peritoneal cavity unopened.

The wide separation of structures allows the contracting down of the bladder walls and permits greater resection of tissues, with more ease of fascia and vaginal-wall approximation. In most of the methods of this character, the incision is made in the median line from cervix to meatus, though some few men advise a transverse incision at the bladder and cervical junction.

The easiest way to do the mucous-membrane separation is by means of the blunt curved scissors, such as the Mayo, inserted through a nick in the mucous membrane at the cervical end of the cystocele, pushed in close under the vaginal mucosa and opened. Thus by blunt dissection the structures are separated ventrally along the cleavage lines to the point desired. The membrane then incised can be readily separated from the sides of the bladder by gauze dissection with a few nicks of fascia bands. All fascia structures should be retained as an added element of support.

The methods of suture application are various. Some advocate the purse-string of catgut, or even silk, to invert the bladder, reinforced by continuous or interrupted catgut or silkworm gut, closing the vaginal walls in a linear direction after the redundant portion has been resected. Others do all the suturing with one or two layers of interrupted sutures.

No method gives better results than the type of continuous silkworm-gut suture applied in layers, as in the Somers perineorrhaphy. We can approximate in this way the ventral segment of the levator ani, the lateral fascia edges, and finally the vaginal membrane. We are not necessarily compelled, except in extensive relaxation, to carry the separation broadly in order to be able to unite these same structures by this method.

The theory of White, that all cystoceles are the result of injury at the "white line," has led him to devise an operation for the purpose of correcting this supposed defect, and this offers the seventh method of operation for cystocele.

"The vagina is held open by two retractors, the ischiatic spine located by palpation and an incision from one to two inches long

made through the mucous membrane, parallel to the 'white line' and extending well up the vagina. The bladder is separated from the vagina by blunt dissection until the spine of the ischium and 'white line' are reached and can be felt uncovered beneath the finger. Hemorrhage is seldom troublesome and can be controlled by a few minutes' pressure. The sutures, which are of chromicized catgut, are passed under guidance of the finger by a Deschamps handle-needle. The first suture goes back of the 'white line' just as it joins the spine of the ischium. The handle-needle is taken off, and each end of the suture threaded on a separate needle; one needle is passed from within out through the median edge of the incision, taking a firm hold on the vagina; the other needle is passed in a similar manner through the lateral edge of the incision. The two ends are then clamped and are ready to be tied. A similar suture is placed half an inch lower down on the 'white line,' and when this is in place both sutures are tied, bringing the lateral sulcus of the vagina in contact with the 'white line' of the pelvic fascia.

"Should there be any prolapse at the outlet of the vagina, the incision may be extended down alongside of the urethra and the vagina sutured to the dense fascia covering the pelvic bone. The opposite side is treated in a similar manner, and when both sides are tied the anterior vaginal wall is drawn up in a normal position and has no tendency to sag, even when the patient coughs or strains. The vagina reaches across from one ischiatic spine to the other without any tension; it collapses when the retractors are removed and normal relations of the parts are restored.

"The operation is always done in combination with other plastic operations, and does not interfere in any way with them, nor does it minimize the caliber of the vagina, which is a matter of importance should extensive denudations be contemplated for a rectocele."

We have already criticized White's claims regarding the causation of cystocele. Provided we acknowledge his reasoning in any particular case, his method of operation has no objection, since it rests upon an anatomical basis. A criticism of the operation would question his claim regarding the etiology and the permanency of the results.

In extensive cystocele protrusion in which ordinary methods of operation seemed to offer little hope of cure, the complete obliteration of the vagina has been done. While this will naturally prevent

the hernia beyond the rima pudendi, it does not fully correct the bladder-sag nor the residual urine. Neither is it inclusive in the consideration of conservative plastic work.

## POST-OPERATIVE TREATMENT

**T**HE after-care of patients upon whom plastic work of the cervix and vaginal walls has been done is not very elaborate. In fact, the less interference the better the results.

There are, however, a few points in the nursing that are vital for the success of the work and the comfort of the patient.

These patients, as a rule, are not excessively nauseated and the danger of shock is slight. The degree of nausea will always depend on the variety of the anesthetic, the sensibilities and preparation of the patient, and, above all, upon the ability of the anesthetist. Usually, these patients need no opiates, for pain is seldom severe enough to warrant their use. The elimination of drugs of this character will do much toward rapid cessation of nausea.

While there are many drugs lauded for their ability to check vomiting, there are few that have any great reliability. The later theories for the causation of post-anesthetic vomiting abandon the idea that it is due to the secretion of the anesthetic in the stomach, and argue that it is a resulting acidosis, producing a brain edema, and that this edema is exaggerated by the use of opiates, although these temporarily quiet the patient. Fischer, who advocates this view, therefore recommends the free use of alkalies preceding and following operation, or the use of fruit acids, which indirectly accomplishes the same results.

Bicarbonate of soda in plenty of hot water will often check the nausea, though as a rule the first glass is rejected. The same is true of tincture of iodine, four drops to a tumbler of water. If these are followed by sodium-diethylbarbiturate (sold under the various trade names of sodium-veronal, medinal, and calmine), in a dose of from two and a half to five grains dissolved in a little water, the complete settling of the stomach is often obtained. This drug, if given per rectum in a slightly larger dose, will often accomplish the same result. Other drugs, such as adrenalin and olive oil, seem

to help occasionally in controlling nausea, but there is nothing that is uniformly successful. The use of gas and oxygen as an anesthetic gives somewhat less post-operative vomiting.

During the first few days the patient is often unable to urinate, especially when the work is extensive, and catheterization should be done with the greatest care as to asepsis and with the least possible disturbance to the perineum. The separation of the labia to too great an extent will produce some degree of separation of the edges of the mucous membranes, and we shall find that the patient complains of considerable irritation at these spots, which, as a rule, do not heal by primary union, but by granulation. This can be avoided if the nurse will separate simply the upper portion of the vulva, and only sufficiently to be able to cleanse the meatus with small pledgets of cotton. The use of a glass catheter is advisable. Not only should the nurse appreciate the necessity for asepsis in catheterizing, but in her care of the patient she should be careful to leave the stitches absolutely alone. Interference with them, while it may not influence the results of the operation, will have a marked effect on the union of the mucous membrane, and consequently on the comfort of the patient. The necessity for continued catheterization is often due to the reflex irritation resulting on account of the prevention of primary union of the mucous edges by careless handling.

If the patient can void urine, the only vulvar cleansing necessary in the first days is the pitcher douche. Urine itself is not injurious to the healing process, and the vaginal discharges, unless infected, are rather more antagonistic than otherwise to germ life. The cleansing with the stream of water will do all that more strenuous but misdirected handling can do, without the danger of irritation.

A pitcher douche of sterile water is sufficient, though I prefer to add lysol or some ingredient of that character, not so much because of its claimed antiseptic value as on account of its alkaline and soapy action in dissolving the secretions and counteracting any excessive acidity of the discharges. A normal salt solution or a weak solution of bicarbonate of soda will have practically the same effect. In all cases a sterile solution should be insisted upon, even if an antiseptic is added.

When the patient complains of more than usual soreness and pain, hot compresses for a short time to the vulva will not interfere with the healing and will often relieve the discomfort. These compresses may consist of the extract of hamamelis or of lead-water and opium.

In all his vaginal operations Cushing used an ointment composed of morphine and cocaine, one grain of each to the ounce of zinc ointment, and at the completion of the operation he partially filled the vagina so that the slow-melting ointment kept the parts continually covered. Such treatment as a routine is unnecessary, but in some cases of irritation, and especially if there has been any interference with the anus, the use of this ointment will give marked relief without producing as much toxic effect as suppositories.

In a case showing considerable swelling and induration, coming on shortly after operation, the use of an ointment composed of guaiacol, ichthyol, and belladonna will often afford great relief and possibly prevent a pus-formation process.

In all cases of plastic work within the vagina, there is, at about the end of the first week, a marked increase in the amount of the discharge, which is probably due to the presence of the absorbable sutures in the normally moist tract, and this discharge, especially when not profuse, on account of its delayed exit becomes markedly odorous. The increased leucorrhæal discharge, the result of the aggravated endocervicitis, recognized by Emmet as often following trachelorrhaphy, has been considered under that head. Where this decomposition of the discharge takes place, the comfort of the patient is greatly helped by the use of a sterile water alkaline douche, given once or twice daily. If the nurse is instructed fully as to the normal direction of the vaginal canal, and carefully inserts the douche point with the water flowing, there is no danger of injury to the operated regions.

It is never of advantage in these cases to use as the ingredient of either the pitcher or the vaginal douche a germicide of the nature of bichloride of mercury or permanganate of potash. These agents coagulate the discharges, and the projecting sutures collect the coagulate, so that the cleansing is imperfect. Such drugs

are often irritating—and this is also true of the cresol compounds when used too strong.

In cases of repair, where the sphincter-anus muscle has been united, Kelly's recommendation is to keep the patient's bowels at rest for ten days by feeding only albumen-water during that period, and then aiding the movement with an oil injection when the bowels are inclined to act from the laxatives given by mouth. He also insists upon the patient remaining upon her side during the first evacuation. This is a modification of the older method of keeping the bowels closed with opiates during the ten-day period, which has not infrequently been the cause of severe auto-intoxication.

In all cases in my practice I have used the continuous suture method of repair, so that the silkworm gut reinforced the catgut approximation of the sphincter muscle, a thorough stretching of the muscle being done previous to the denudation. I have in no way treated the patients otherwise than in an ordinary perineorrhaphy, except by exerting greater care to feed a diet with small waste and to procure soft bowel movements, and have always had satisfactory results.

Kelly and Noble report a percentage of failure of one in twenty in complete perineorrhaphies, on account of infection. I believe that with the continuous non-absorbable suture the percentage of good results should be much higher. So far, in both recent and secondary cases, my results have been good where this type of suture was used. Two of these had a mild degree of infection, yet with successful results.

In all cases of perineorrhaphy the best drug for the bowels is castor oil, both as a preparation and as the first laxative after operation. The second morning following operation a dose is given, and then if other laxatives are needed the patient's preference or custom is consulted. In complete perineorrhaphies the use of sulphur and cream of tartar aid in keeping the passages soft.

Occasionally, if much catheterization is necessary, or if there has been complaint of bladder irritation before operation, urinary anti-septics, such as salol, arbutin, or hexamethylamine, with demulcent drinks, are of service.

I am glad to say that the old method of tying the patient's knees

together after a perineal operation has been rather generally discarded, though some surgeons still cling to the custom. If we consider the position the patient occupied on the operating-table when the work was being done, it is easy to see that the patient can hardly injure the operative results by the separation of the thighs. The strain from vomiting, coughing, or hiccoughing puts just as much, if not more, tension upon the pelvic diaphragm than can be applied by voluntary exertion, so that the attempt to restrain the patient by tying the knees accomplishes nothing but the discomfort of the individual. As a rule, the patient is only too glad on account of the soreness of the parts to restrain her own movements. In immediate repairs it is well to avoid for the first week any sudden or straining movements, for such might, especially in an interrupted-suture repair, put unnecessary strain upon the united structures and tend to make the sutures cut through the relatively soft tissues.

It is best not to permit a patient to sit up before the end of the tenth day. After that time the parts are pretty thoroughly united and will stand some tension. The sutures, as a rule, are left that length of time.

The patient should be cautioned against any actions which will put too much strain on the pelvic diaphragm for at least several weeks following the return home, for while it may have no bad effect on a well-repaired perineum, it is just as well to be on the safe side, and it will aid in the general recuperation to encourage rest and avoid overexertion.

It is interesting to watch a well-repaired perineum increase in strength as time passes, through the development of the muscles which had undergone considerable atrophy by the limitation of function. Without proper muscle support no amount of care or rest will prevent the gradual recurrence of the relaxation.

So far nothing has been said regarding the local preparation of the patient for the vaginal plastic work. The careful shaving and preliminary cleansing of the vulva with soap and water, followed by two or more copious vaginal douches, are always essential. In these douches some operators use a liquid soap and require the scrubbing of the vagina with a mounted gauze sponge while the

solution is running, but care must be taken to avoid using sufficient force to injure the mucous membranes. This is followed by some antiseptic solution, and then possibly by sterile water, the douches being repeated in the morning before operation.

Here, as well as in all other operative work, the use of iodine has become almost universal, and applications of every strength have been recommended. Undoubtedly, iodine is a most excellent preparation for emergency cases of all sorts, and especially dirty ones. But the pendulum is beginning to swing the other way, as we are realizing that iodine has some disadvantages. It has been shown recently in experimental abdominal surgery that the unprotected iodine-covered skin may carry enough drug to the peritoneum to cause firm adhesions wherever contact has occurred. Again, cases of iodine dermatitis are coming to light continually. Unless in very weak solutions, iodine as a routine in vaginal work is not wise, since the vaginal canal has much greater absorptive powers than the skin, and in a susceptible patient sufficient quantity of the drug may readily be absorbed to produce a systemic effect. Even a small quantity will occasionally produce a severe dermatitis of extensive area not at all easy to relieve and often more uncomfortable to the patient than the operative procedures. Iodine, too, by the discoloration of the tissues rather interferes with the differentiation of skin and mucous membrane and hinders accurate approximations. If used at all, it should be applied only in weak solutions.

The vaginal tract is resistant to the germs which normally are present there, so that careful cleanliness with the exclusion of outside sources of contamination through careful aseptic technique is sufficient to prevent infection, and too strong antiseptic solutions are to be avoided. By the use of irritating solutions we may set up conditions which will favor germ development. If an infection of pus-forming character is already present in the pelvic tract, no variety or quantity of antiseptic or germicide will prevent a lighting up of the condition with the probable failure of our operative work. So in all suspected acute or subacute processes our policy should be one of non-interference unless special indications arise. Here, as in other surgical work, the knowledge of when to avoid

intervention or when to postpone it is just as much a criterion of the surgeon's skill as the correct doing of the operation itself and the correct carrying out of the after-treatment.

## PROGNOSIS AND POST-OPERATIVE COMPLICATIONS

NOT only for the physical but also for the mental well-being of the patient the results of efficient plastic work are always good. The complications that may arise at the time of operation or later are not many and can usually be avoided, so that, when all factors are considered, there are few branches of surgery that yield such uniformly satisfactory results.

The full measure of improvement, however, is not felt before six months or more. While the immediate gain from the support is noticeable as soon as the patient is upon her feet, through the removal of the bearing-down feeling, the better control of the rectum, and the clearing up of the bladder symptoms, yet time is essential for the building up of the undermined nervous system. It is no unusual happening to have a patient return at the end of four or five months disappointed that she still feels nervous, irritable, and is readily tired; but if our diagnosis has been complete and our work well done, we are safe in giving assurance of the improvement that is bound to come, and come the more rapidly the greater the physical care employed. Generally, a few months later such patients are only too glad to report that they never felt better in their lives, for the gain both physically and mentally is well marked. One patient, and one who exhibited not more than the average improvement, expressed her feelings thus:

"In the face of the great change it would seem a simple thing to say that the pain and weariness have stopped—though, in truth, they were no simple things while they lasted. But it is not only what has gone, but also what has come.

"That miserable phrase 'female trouble' is such an old—one—so old, so accepted that to rebel against its inevitableness is almost to question the eternal verities! So many days of sunshine and wind, joy of life and work, flash of vision and strong pull of endeavor, lost each month! So many hours of agony, creeping, straining, crashing to the roots of one's mind—breaking into all the

wholeness of life and peace!—then the drugged quiet and the light going out.

“Nor is this all. Every month a little less strength to go on with, a little less control, a little less hope. And always gathering in the background tense hysteria. But one was supposed to bear that. It was almost a womanly virtue to be frail. And certainly womanly traits to be hysterical and unreliable!

“One can bear the pain. But it is not right to see the days pass—empty.

“But now life seems a new chance. The pain and the shadows and the weariness have gone. The memory that was failing, failing every time the light went out, is quick and true again. My body is my own again. It does not desert me when I need it. It does not weigh me down when I would forget it. I fight no more devils in the dark. I could tell you all the pathological symptoms, but it is a bigger, truer test to tell that life is good, and that the work has wings.”

This sentiment, though expressed a little more graphically than usual, conveys an idea of the general post-operative satisfaction of the patient.

There are a few factors whose presence may interfere somewhat with the customary good results and lead to disappointment—factors which we cannot consider as operative complications. For instance, sometimes in cases of tertiary or latent syphilis we find to our great disappointment that, while the results immediately after the patient's convalescence are excellent, a gradual stretching out of the scar takes place, so that, without any apparent reason, a considerable relaxation has occurred with a recurrence of many of the nervous symptoms. Usually in these cases the general evidences of specific infection are not marked; otherwise, operative procedures would probably have been postponed; and, consequently, specific measures are not instituted in order to prevent the bad results. It may even be that the failure to obtain a permanent result is the first thing that leads us to investigate the possibility of specific infection.

The same systemic infection may lead to a failure in cervical work, but here it is expressed through a recurrence of the inflamed, hypertrophic condition for which the operation was undertaken. However, in specific infections involving the cervix we are not

justified in excusing our lack of realization of the true pathology, as we perhaps may be in perineal conditions, for it should always be borne in mind that cervical pathology resulting from injury may be aggravated in syphilis. In the luetin skin reaction and the Noguchi and Wasserman blood tests we have aids to a positive diagnosis. While, of course, operation sooner or later is essential, it is wiser to first obtain control of the general condition, if we are to expect good results.

Another factor that has already been mentioned is found in a small class of cases of relaxed vaginal outlet in which there is excessive redundancy of the vaginal walls—not those cases associated with prolapse of the uterus, but a condition in which the cervix remains at the normal level. This redundancy seems to be a relaxation of the tissues generally, rather than the result of distention from cleavage injury alone, and the question of its correction is not an easy matter. The building up of the ventral vaginal wall and of the pelvic diaphragm and floor does not, as a rule, take up sufficient slack to give the vaginal walls the support required to accomplish the desired gain in tone, especially in cases where a flap repair has been done. With the ordinary amount of plastic work, the improvement is very marked, but still there is sufficient redundant tissue left, so that when using a speculum the walls crowd in and make an examination of the cervix difficult. If the patient bears down, there is more or less tendency to bulging of the walls, even though well supported by the perineum. This tendency of protrusion of the walls has in time an unfavorable influence on the perineum, and a relaxation of that may occur. But previous to this condition, on account of the poor dorsal support of the upper portion of the ventral vaginal wall, the bladder is not sustained as it should be, and the cystocele tends to recur, though within the vagina.

When this condition is due to a general lack of tone in the patient, efforts directed to building up the physical condition, with the avoidance of overexertion, will do a great deal toward continuing the improvement started by the operative work. The local use of depleting tampons, to be followed by astringent douches, which should be of only moderate temperature, will aid much. It

is not generally recognized that in some women hot douches will favor a relaxation instead of producing the blood-vessel contraction that the prolonged use of heat is intended to accomplish. Neither do we always appreciate the excessive amount of pressure that may be exerted from above by an improper corset, especially in these cases of relaxation. This pressure not only interferes with the venous circulation, causing congestion, but it produces the same character of sagging and relaxation just considered.

In these cases, however, a better surgical support of the vagina is almost a necessity, and should be planned for primarily. If the woman is beyond the child-bearing age, we are, of course, at liberty to do a much greater resection of tissue, and thus obtain better support throughout the whole vaginal canal. In the child-bearing age, however, it is often difficult to judge the degree of denudation and how much building up of the fascia layers beneath the mucous membrane may be done so as to correct the relaxation but yet allow room for a subsequent labor without the danger of splitting the vaginal canal. Fortunately, most of these patients have their condition as a result of successive labors and are usually near the menopause. If not, we simply have to do the correction as extensively as is compatible with possible subsequent labors, even if later it may necessitate more operative work. A woman who is anxious to have children readily agrees to possibility of reoperation. In the correction of this type of relaxation practically the only perineal repair to be considered is the Hegar type of denudation, which allows for the reconstruction of the fasciae and the support of the rectum.

There is a milder degree of relaxation which might be spoken of as a recurrent type. The patient is immensely improved by the operation, but from time to time has a recurrence of the irritable bladder or the bearing-down feeling. These cases are essentially due to a lack of tone, not always confined alone to the pelvic tract. Following periods of overexertion, either mental or physical, the symptoms usually return. It is in women who "live on their nerves," as the saying is, and who are continually going beyond the limit of their strength, that we find such a delayed period of full improvement; and it is not to be wondered at, for it takes

time for any body structure in which an oversupply of blood has been present for a considerable period to cease to respond through its still dilated vessels to any abnormal stimulus. As time passes, if recurrent congestion is avoided, the tissues undergo a permanent contraction and congestion occurs less easily. These patients usually respond to the simple depletion methods after a few treatments, but require general supervision for some time, in order to prevent, if possible, any abnormal conditions in life tending to reduce the general resistance.

The immediate dangers at the time of operation are not many and can always be avoided with care. There is some danger of injury to the adjacent organs—the bladder in ventral colporrhaphy, and the rectum in dorsal. Hemorrhage may occur in any part of the work, but more especially in the trachelorrhaphy and perineorrhaphy.

An entrance into the bladder and rectum need not, as a rule, occur if care is used. Where it does occur, it is generally the result of too hasty handling of excessively thinned septa or structures distorted by scar tissue. I have, however, seen a few cases where the friability of the mucous membranes was so marked that the greatest care did not prevent injury to the rectum, and some of these occurred in the hands of the most skillful operators.

When hemorrhage takes place, it is usually in the perineorrhaphies, and is of venous character, due to injury of the rectal plexus. The properly placed suture will readily control this type. There is a chance of more severe hemorrhage, and a hemorrhage more difficult to control, in the type of operation which does excessive dissection, such as has been discussed under perineal repair. In the practice of the best men I have seen bleeding start up from a location difficult to reach after the completion of the operation, but never have I seen it occur where the simple denudation was done and the muscle picked up without further dissection.

The secondary bleedings from the cervix occurring shortly after the recovery from the anesthetic are due to poorly placed or insufficiently tied sutures in the angles, so that care in placing these deeper sutures will avoid that awkward sequela. A pack in the vagina, in case the complication arises, may be sufficient if the bleed-

ing is not severe, though it will endanger the perineal repair unless very carefully placed. If the flow comes from a larger vessel, it will necessitate the application of a suture well out in the angle of the denudation. This is such an annoyance to surgeon and patient, on account of the necessity for more anesthesia and the danger of injury to the repaired perineum, that it is always well to inspect carefully every cervical repair before leaving it, and if there is any suspicion of bleeding, to apply a reinforcing suture at that time. We must remember that the bleeding point is at the deepest portion of our denudation and from a branch of the circular artery, and the suture may need to be applied even above the denuded angle. Care in these seemingly minor points of plastic work will tend very largely to freedom from anxiety on the surgeon's part and better results by the avoidance of interference at unfavorable times.

Secondary hemorrhage from the cervix occurring as late as the tenth day has been mentioned. The probability is that the majority of such cases are the result of infection, though I once saw it happen in a case in which the surgeon removed the stitches before the tenth day. Mild grades of infection in the uterus and tubes will often interfere seriously with the repair process. The absorbable sutures dissolve much more rapidly in the presence of infection, and when they have disappeared we find a granulation process covering the denuded areas with only slight or no attempt at union. A little increased motion or slight mechanical interference, or even the inflammatory process alone, may be sufficient to start a bleeding from the circular artery. To control such bleeding suturing is necessary, but from this second suturing there is little prospect of a perfect cervix.

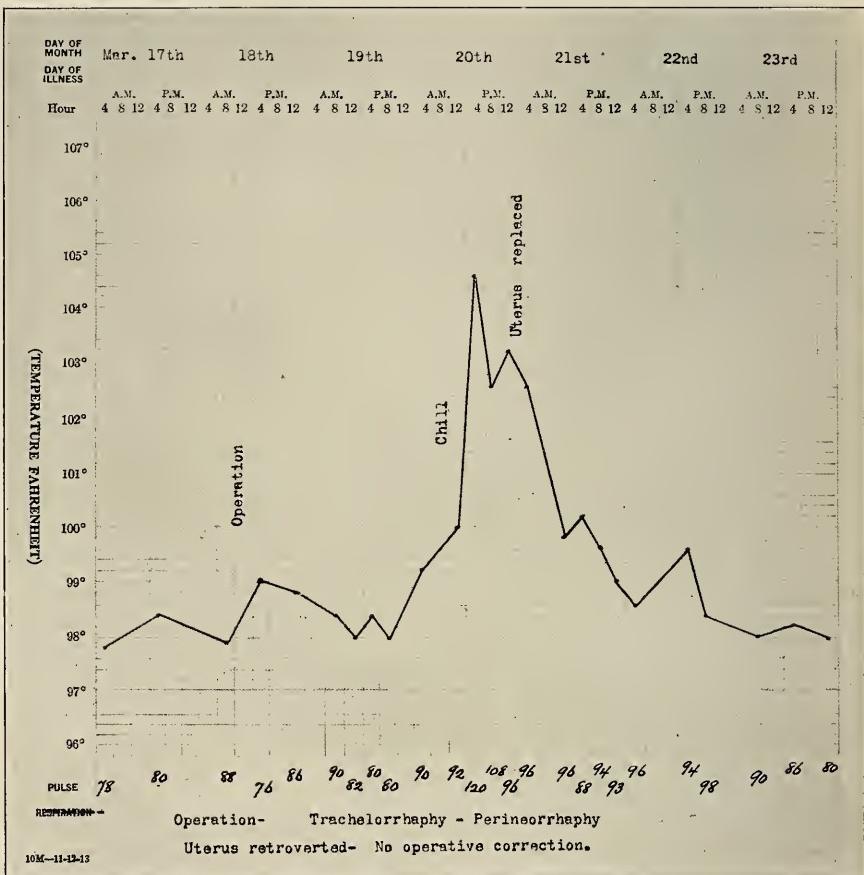
The use of absorbable sutures of sufficient resistance to last over ten days is best in cases accompanied by perineorrhaphy, if there is no possibility of infection, as it is better to avoid interference with the perineum in the first three weeks. In case no perineorrhaphy is done, or if infection is feared, non-absorbable sutures may be used, but their removal should not be undertaken inside of fourteen days. The cervix always looks more or less irregular after the removal of stitches on account of the depressions left by the

sutures, but, as a rule, in a few weeks the irregularities disappear and the surface assumes a normal aspect.

Occasionally, in amputation of the cervix, the drainage suffers interference through a temporary adhesion of the incision edges, and the fluids are retained within the uterine cavity. The same lack of drainage may occur in a simple repair, if, by chance, the uterus in being pulled down has been displaced and left in the retroverted position. A small clot lodged in the canal may also have the same effect. This retention of some curettage remnants or menstrual blood shows itself in a few days after operation with a chill and a sharp rise of temperature, usually followed by profuse perspiration. Previously to the chill there is a slight elevation of temperature present, but, as a rule, it has been considered naturally as the ordinary operative reaction. Such a condition is readily remedied by a vaginal douche with a few doses of ergot or other oxytocic. It is to prevent such obstruction that the use of a loose gauze wick within the cervix in amputation was advised in the operative procedure. The removal of this gauze at the end of thirty-six or forty-eight hours leaves the canal patent. Also, it is important before the patient leaves the table to make sure of a correctly placed uterus in cases in which there is no abdominal work to be done. If the uterus is found out of position later, the knee-chest or Sims's position will usually correct the condition without instrumental interference, though the necessity for air entering the vaginal canal must be borne in mind. However, the less we have to interfere with our patients after perineorrhaphies the better the results will be.

After the menopause, when the mucous membranes normally become more or less atrophic, it is not uncommon to find that adhesion has taken place between the ventral and dorsal vaginal walls, or between them and the cervix at points on the suture lines. These unions are often fairly firm, but, as a rule, can be readily separated with the finger when the sutures are removed. If no vaginal examination is made at the time the perineal stitches are removed, and the condition is overlooked, later on it may be impossible to separate the approximation without dissection. It is not always necessary to have two incision areas in apposition to have such a

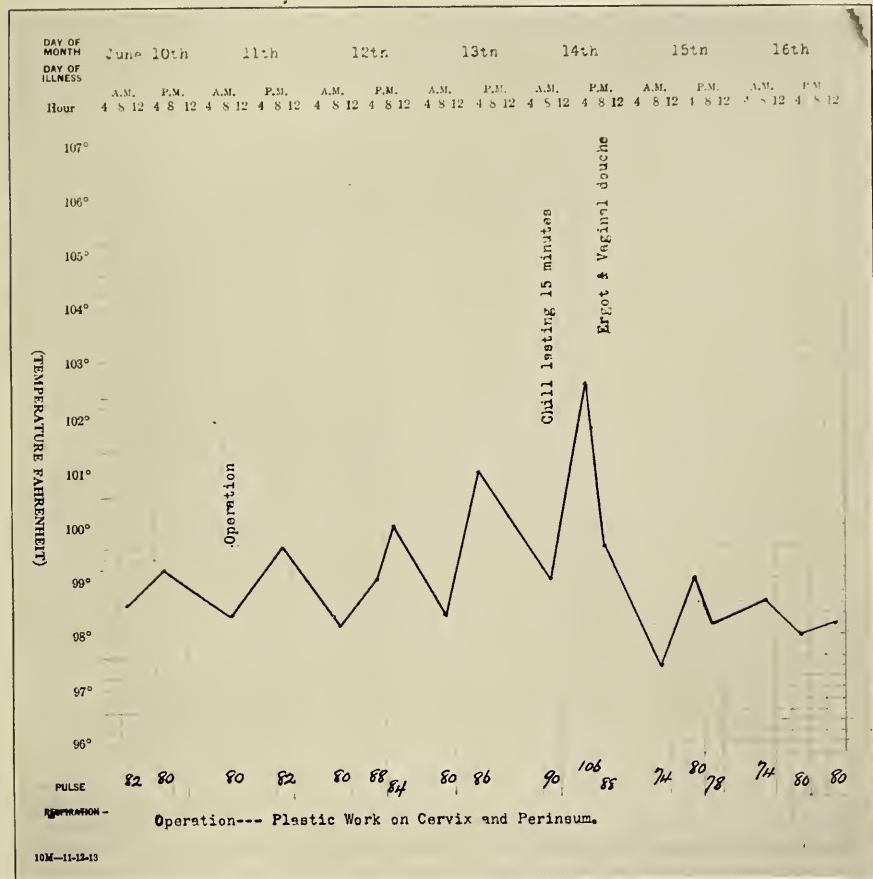
complication arise, for the senile membrane itself, if injured by friction, will readily unite with the line of incision on the opposite wall. In fact, in senile vaginitis very frequently opposing areas will become adherent, even without any mechanical interference of



A case of retroverted uterus with relaxed vaginal outlet and a lacerated hypertrophied cervix. The patient refused abdominal operation or other method for correcting the retrodisplacement. The uterus becoming displaced after operation, the drainage was interfered with, and a suppurative condition resulted. The replacement of the uterus through the knee-chest position re-established the drainage. In these cases the pulse rate is out of proportion to the temperature, and the leucocyte count is not increased, factors that are against a diagnosis of infection.

operation, when the lining membrane has become excessively thin and friction has resulted in erosion. I have seen the adherence of the vaginal walls occur in two cases where there had been con-

siderable swelling of the structures following operation, and in one case where union of an amputated cervix and a ventral colporrhaphy occurred—these three cases in women well under the menopause and with normal vaginal walls. While such a complication



In this patient the plastic work upon the cervix produced a temporary gluing together of the surfaces, thus interfering with the drainage. The uterine cavity had been curetted, but the debris had been removed by gauze without irrigation. A vaginal douche with a dose of ergot produced sufficient uterine contraction to re-establish drainage.

is not common, it is well to bear the possibility in mind, and never permit a patient to leave the hospital without a digital vaginal examination, even if the use of absorbable sutures has eliminated the necessity for removal. If such an adhesion becomes firm and is of any great extent, it may give rise to unpleasant complications.

After plastic work it is not at all unusual to find a recurrence of the menstrual flow, even though the patient has just completed the normal period. This return seems to be largely due to the reflex congestion of the ovaries, as a result of the irritation of the cervix by the presence of the sutures. It is not found, as a rule, if the uterus and cervix are not interfered with. On the other hand, it is often present after pelvic abdominal operations where no plastic work has been done.

The question as to what time of the month in relation to the periods is best for operative work has usually been decided as immediately following a period. It is true, and especially in the abdomen, that then there is less trouble in controlling the capillary bleedings, but this is probably the only reason for choosing this time. In plastic work the bleeding is freer during, or especially just before, the period, yet it is never too great to interfere with the work or prevent ready control. It is very questionable whether the bleeding from the curettage and trachelorrhaphy, if done just prior to a period, will head off the normal flow. In some cases it will, but, as a rule, the menstruation is only delayed a few days, and then occurs probably on account of the stitch irritation of the cervix.

It is in acute or latent salpingitis that operative interference even for simple plastic work must be avoided, for then the traction on the cervix necessary in repair work is sufficient to light up the inflammation and produce pain and temperature with often a failure to heal. If such a condition is suspected, the omission of a curettage is wise; but it is always better to postpone any operative work of this non-emergency kind until we are sure of the subsidence of the infection.

The presence of the gonococcus, as a rule, does not seem to interfere with the healing, yet it is not safe to recommend operative interference in its presence. Cases of suspected latent infection in the glands of Bartholin, unconfirmed by microscopical examination, may sometimes be submitted to operation on account of the great improvement to be attained by operative work. In a few such cases I have seen good results, though considerable local reaction and swelling occurred immediately following operation. In each

case the continuous suture was used in the perineorrhaphy, and I question whether interrupted sutures would have given the same satisfactory outcome.

It is always safer to omit the curettage if infection is suspected, for it may be just the irritation sufficient to light up a tubal involvement and result in the development of a pelvic abscess. One cannot too strongly condemn the tendency to interference in acute tubal conditions before a complete subsidence of the infection. It is not only dangerous to the life of the woman, but, if she survives, is the forerunner of many pathological pelvic conditions. Few women have ever lost their lives by the conservative treatment of tubal infections.

It has been proven conclusively that after a period of time has elapsed, placed by German authorities at two years, the pus within the tubes becomes sterile, thus permitting of safe intervention. The only acute condition where operation is permissible is the pelvic abscess formation, and that, by vaginal drainages only. The rare pyosalpinx rupture probably is best treated in the same way. In a pyosalpinx complicating an acute appendicitis, drainage through the abdomen and cul-de-sac combined may be necessary. In simple acute tubal infections I believe that operative interference is absolutely unwarranted.

## MISCARRIAGE AND STERILITY

**I**T IS generally recognized at the present time that a simple flexion of the uterus is not sufficient in itself to offer a barrier to the spermatozoa, and thus prevent pregnancy. Either the inflammation of the cervical mucous membrane (which is so often associated with the anteflexion) or the infantile character of the pelvic organs (which in varying degrees is at the base of the etiology of the condition) is the factor that prevents conception.

There are cases unassociated with inflammation where sterility exists, and where it can be overcome by a thorough dilatation with the wearing of a stem pessary. This treatment, however, is effective more because the presence of the foreign body within the uterine canal stimulates the development of the undeveloped organs than because of the correction of the stenosis.

Yet, on the other hand, Pozzi's operation, done to enlarge the os, has to its credit a sufficiently large proportion of sterility cures to show that in some cases the smallness of the external opening bears considerable relation to the absence of conception. This may be due directly to the enlarged opening permitting the spermatozoa to enter more readily. Indirectly it may be of value by affording freer drainage of the cervical canal, and thus preventing its obstruction by mucous plugs.

The operation advised by Pozzi to correct sterility consists of two lateral incisions separating the ventral and dorsal cervical lips and the closure of each raw area laterally by interrupted sutures so as to prevent reunion. Pozzi insists on silver wire with a cone-shaped lead shot for this purpose.

He recently reported a large percentage of resulting pregnancies, with no bad effects in those cases not successful. No cases of miscarriage are reported.

However, other operators have had cases where the after-effects were not good, on account of the irritation of the exposed mucous membrane. Cases of miscarriage following incision of the cervix

done for menstrual pain are not uncommon, and are in practically the same category.

By this operation we are actually getting the conditions which result from a torn cervix, though, of course, without the scar tissue at the angles. The possibilities are present for irritation of the mucous membrane through exposure, thus giving rise to the train of pathological processes already considered. The scar tissue in the angle undoubtedly plays a very important part in the pathology and symptomatology resulting from cervical injury. In order to get approximation of the mucous membranes without scar tissue, Pozzi carefully removes a wedge-shaped portion from each side so as to permit of accurate approximation. His reports of good results serve to emphasize the importance of the scar-tissue angles in cervical inflammations. Possibly those operators reporting inflammatory sequelae failed to get perfect primary union, which naturally resulted in scar tissue.

Viewed as a whole, the indications for an operation of this kind are narrow. It is never indicated in the presence of any inflammatory processes or in any pathology of the uterus or appendages that might account for the sterility. When done, it should be done with great care, to avoid scar-tissue formation.

The same indications apply, though in a somewhat narrower sense, to the Dudley-Reynolds operation as a cure for sterility in anteflexion. These operations may be done even though a chronic inflammation of the cervix is present, which condition ought to exclude Pozzi's method.

The Dudley operation, which is a modification of Sims's dissection of the dorsal cervical lip, advised for dysmenorrhea and sterility in cases of uterine anteflexion, consists of a median vertical incision in the lip, extending through the internal os and down to the uterovaginal junction; a wedge-shaped segment is then removed from each side, so as to permit the folding over and closure by suture of each raw area. The purpose of this procedure is to change the direction of the external os and make straight and wide the cervical canal. Dudley's modification was devised to prevent the exposure of any cervical mucous membrane to vaginal irritation, such as often occurred with the original Sims operation.

This Dudley operation is frequently combined with the Reynolds, the latter being a modification of Skene's anterior incision, advocated for the same indications. An incision an inch and a half long is made transversely at the vesicovaginal junction down to the uterine tissue. By blunt dissection, the bladder and uterus are separated to a point above the uterine flexion. Then the raw area is united vertically without including the uterine tissue. This operation lengthens the ventral vaginal wall and straightens out the uterus, so that the external os points backward in a more normal direction.

These two operations were devised for the purpose of correcting the mechanical abnormality of the uterus; the supposition being that the pain would disappear because of the more direct and patulous canal, and that the sterility would be cured through the same factors, and the more normal position of the os.

Recently Holden, of Brooklyn, reported the results of forty of the combined operations done in a period of over nineteen months. His percentage of cures of the dysmenorrhea was eighty-five; of the sterility, twenty-five. Previously Breckner had reported seventy-three cases in over six years' time, with sixty-five per cent of dysmenorrheas cured and twenty-seven per cent of sterilities relieved. All cases evidently included as a primary procedure the dilatation of the cervical canal.

These reports are interesting from the standpoint of the correction of the sterility as well as the relief of the pain. It is a question, however, whether or not the dilatation alone would have been sufficient, for we know that a thorough dilatation will relieve these symptoms, though not always permanently. These Dudley-Reynolds operations would be of more value from the scientific point of view if they had been preceded by an attempt to accomplish the same result by simple dilatation. Of course, there is no doubt that the patulous os and canal are obtained more certainly and permanently by the Dudley-Reynolds method, but, on the other hand, it is a more exact surgical procedure, requiring great care for good end results; poor results are probably factors that favor miscarriage.

Practically, I believe that all that the Dudley-Reynolds method

accomplishes is the better drainage of the canal. The resulting drainage permits a greater chance for the clearing up of the inflammation that in the great majority of cases of anteflexion is back of both the dysmenorrhea and the sterility. We have spoken of the class of undeveloped uteri unassociated with inflammation. Naturally, these are in a somewhat different class, and are the cases that may be aided by a stem pessary.

The relief of pain is probably largely the result of obtaining a larger and less rigid internal os through a perfect operation. With a patulous internal os there is less chance of the menstrual blood collecting and causing clots within the uterine cavity, and thus producing the colicky pains of expulsion. Yet in Breckner's cases 33.3 per cent of the dysmenorrheas were not relieved. It is probably true that the congestion present in these pathological cases of anteflexion alters the normal proportion of blood, lymph, and mucus, and thus favors clotting.

In Breckner's cases 33.3 per cent of the dysmenorrheas were not relieved, though they were all patients supposed to be free from tubal or ovarian pathology. To be of greater value, these case reports should consider more in detail the character and degree of inflammation in the cervix previous to operation.

From the pregnancy standpoint alone, we know that the direction of the os has little to do with the prevention of conception. Retroversion is not, as a rule, recognized as a cause of sterility, and yet the os is always out of its normal direction. There are many women also in whom pregnancy readily occurs in spite of the fact that the uterus is in such extreme anteflexion that in many of them it returns to its flexed position after each pregnancy. We are surely justified in the conclusion that in the far greater number of cases the symptoms in anteflexion and the sterility are secondary to the inflammation, and that the cause of success in curing these conditions by the Dudley-Reynolds operation is the subsidence of the inflammation by drainage. We shall find that some patients will by ordinary local treatments get over their inflammations and become pregnant.

In cases that have had a chronic endocervicitis over a long period, which has resulted in a cystic degeneration of the cervix, with

a hypertrophy of all the cervical elements, the mistake is not infrequently made of expecting a stem pessary to cure sterility. An operation that in reality often amounts to an amputation or an Emmet repair, even though the cervix has never been injured, is the only method in such cases for obtaining relief. This has already been discussed under cervical inflammations. In these cases it is the increased amount, the tenacious character, or the change in reaction of the cervical-gland secretion that accounts for the sterility. A stem pessary used where the mucous membrane is diseased is usually productive of more congestion and an aggravation of the inflammation.

The pathology of the cervix has a very vital bearing on the question of what might be called a relative sterility—that is, the inability of a woman to go to term, or the non-occurrence of pregnancy after the first child. We must ever bear in mind the frequency of the abortion tendency in syphilitic individuals and recognize that disease. Though in most of these cases the termination of pregnancy is the result of syphilitic changes in the placenta, I believe it is sometimes due to the syphilitic cervix, and not necessarily dependent upon the placental pathology.

Another cause of sterility in which, of course, the cervix plays no part is the tubal obstruction or distortion due to pelvic inflammation. Eliminating these two classes, I believe, we have a very great number of relative sterilities due to cervical injuries.

Personally, I consider that a most frequent etiological factor in both the non-occurrence of pregnancy and the occurrence of miscarriages is the lacerated cervix, especially if associated with the resulting inflammation. In many cases this is further aggravated by the relaxation of the vaginal outlet.

Very frequently, indeed, a woman with a lacerated cervix or a relaxed vaginal outlet, or both, is advised to wait until the child-bearing period is over before having the injuries repaired. The physician who advises waiting argues that, despite the repair, there will be a recurrence of the injuries at the next pregnancy, and that little wisdom is shown in doing something that, in his opinion, would probably be undone. Even some of our supposedly best authorities still recommend such a procedure and overlook

the possible future complications. Is it not better to do a minor operation, and repeat it later should the tears recur, if by so doing we are enabled to avoid possible miscarriages and an almost certain major operation, to say nothing of having the woman in good health pelvically? .

The likelihood of as severe injuries with subsequent labors is never so great as with the first child, whether a good immediate repair or a secondary perineorrhaphy has been done. The profession has been well drilled in the theory that an epithelioma of the cervix has always as a forerunner the lacerated cervix, and as a result most severe cervical injuries are repaired when discovered. But lately even that stimulus to putting the woman into at least a partial state of good health is being assailed by many writers, who scout such a theory, claiming that cancer of the cervix never begins in the tear. Statistics show that cervical cancer has always been preceded by dilatation of the cervix, either by labor or from an operation. Some authorities believe that it is recurrent injuries that favor malignant developments of the cervix. Instead of belittling the injured cervix as an etiological factor in cancer formation, it is wiser to bear in mind the clinical evidence. Perhaps it is unfortunate that there is not some similar possibility to stimulate perineal repair.

Severe cervical injury with its resulting inflammation usually prevents pregnancy, but its symptoms are sufficiently marked to attract attention and result in repair. The moderate degree of injury which may give few symptoms, and which more often than not is passed over by the examiner as of little significance, is the one which is frequently unrecognized as a cause of sterility or miscarriage, and this is the type I wish to emphasize.

Herman, of London, in his book on gynecology advises the Emmet operation as a preventive of abortion, since sometimes patients with deep lacerations of the cervix repeatedly miscarry. His explanation is that during pregnancy the body of the uterus contracts intermittently, and if the cervix is weakened by deep lacerations its normal power of opposing the contractions is destroyed and abortion results.

I believe that more stress should be laid upon the inflammatory

sequence and the stretching out of the scar tissue. Every injured cervix in which the cleft persists has the formation of scar tissue in the angle, and as the uterus enlarges this scar tissue stretches out, weakening the supporting power of the cervix. If only the deep clefts were associated with the abortion cases, Herman's explanation might be sufficient, but many cases are not associated with pathology of gross character and the deep cleft is wanting. In some of these cases the inflammation that is secondary to the scar-tissue formation, causing endocervicitis and later cervical hypertrophy, may not involve the uterine body as a whole, but may extend high enough to interfere with the placental development, as the fetus grows, and favor placental separation, and, consequently, the termination of pregnancy. In these cases of border-line pathology probably all three factors are at the base of the frequent abortions.

Practically, no emphasis has been placed on the influence that the relaxed vaginal outlet exerts in exaggerating cervical defects, and thus its consequent relation to this type of miscarriage, but in many of these patients the cervical repair would not alone be sufficient, for the pathology of the cervix recurs with fair rapidity, due to the drag of the vaginal walls from below and the pressure from above, with the resulting congestion.

This same relaxation which favors the descent of the uterus naturally tends to exaggerate a pathology in the cervix. Under a normal condition of the perineum this degree of pathology might not be sufficient to result in abortion. The relaxed outlet is seldom alone primarily the cause of miscarriage, for it is only in the first few months that it has any direct bearing on the position of the uterus, as that organ grows rapidly out of the pelvis, and then is practically self-supporting. But it bears weight by its indirect action on the cervix, through the greater chance for increased irritation by friction and dragging that results in inflammation. Thus occurs the exaggeration of what might, under other circumstances, be minor pathology. Consequently, it is just as important to remedy the relaxation of the outlet as it is to repair the cervix in these cases that are subject to a too early termination of pregnancy or to sterility.

Sterility is in practically every case the direct result of the inflammation within the cervix. This inflammation frequently alters the chemical reaction of the cervical secretion, by which spermatozoa are destroyed, or produces such an increase in the quantity of secretion as to form a tenacious mucous plug of the canal. In these cases especially is it important to repair any defect of the pelvic diaphragm and floor, since these defects are often the cause of the cervical inflammation.

A history of the following rather exaggerated case will serve to illustrate more forcibly how small a degree of pathology may be the direct cause of the abortions:

"Mrs. A. R., aged thirty-eight, was exceedingly desirous of having children, and was referred for an opinion as to whether or not a mild degree of cervical pathology was sufficient to account for the too early termination of the pregnancies. The menstrual history previous to the first conception was without marked abnormality, and there was nothing in the general history that could influence the pregnancies, with the exception of a rather marked recurrent anemia of transient duration. The first pregnancy had resulted in an abortion at three months, and the physician who had attended at the time spoke of the inflamed and everted cervical mucous membrane. A second pregnancy, a year later, had also terminated at three months, there being in neither case any discovered cause. Conception occurred again a year later, the fetus being carried for six months, when labor again intervened without warning. The last pregnancy, which, like the first two, ended at three months, occurred two years ago.

"Pelvic examination showed a normally placed uterus, slightly enlarged, a cervix somewhat hypertrophied, with an erosion on the ventral lip and a few Nabothian cysts. The pelvic outlet was somewhat relaxed, though without any marked cleavage defect.

"The suggestion of performing a cervical amputation with a perineorrhaphy was gladly accepted. Within two months after leaving the hospital the patient was again pregnant; went through a normal term in excellent condition and with less discomfort than during the former pregnancies, and delivered herself with only a moderate degree of injury to the perineum. Throughout the pregnancy a careful watch was kept on the blood, and an iron tonic used occasionally, as had been done in the previous pregnancy. This patient expressed herself as being very conscious of the increased support from the perineum and the comfort obtained therefrom."

This case is an extreme one of frequent miscarriage without any systemic cause, and depends without doubt on the cervical pathology.

The following history is typical of a considerable number of cases of what has been referred to as relative sterility, or sterility occurring after the first pregnancy:

"Mrs. B., aged thirty-two, had five years ago an abortion at six months, following a fall, and no conception since. The physicians consulted recognized nothing abnormal and had no suggestions to make. The general health of the patient was good, and the only complaint was of some increase in the menstrual flow followed by leucorrhea. Examination showed a normal pelvis except for a moderate degree of cervical injury, a slight eversion of the mucous membrane, with an eroded area on the dorsal lip, and increased cervical discharge. The correction of the cervical pathology by operation was followed some months later by conception and in due time by a normal delivery."

Gross cervical pathology is generally recognized as a possible cause of sterility or of the too early termination of pregnancy, but the minor degrees of injury or inflammation are too often passed over, and seldom do we hear of the relaxed outlet as of importance. It is true that many women, in spite of marked defects in the pelvis, bear children with small inconvenience, but this does not alter the fact that there are women with only slight defects who are unable to do so. It depends, I believe, in a large degree on the sensibilities of the individual to irritation, which is a factor that must always be borne in mind, especially in pelvic pathology. A condition that will make an invalid of one woman will seemingly cause no inconvenience to another. The modern woman, however, with her wide interests, her intense life, responds readily to the external, mental, and physical stimuli surrounding her at all times, but does so at the expense of her nervous stability, and this naturally favors a greater reaction to any pathological process. These things are factors that should be taken into consideration in deciding upon the advisability of operative interference in border-line pathology. With so many strains upon the nervous system, it is well to consider carefully the effect of even a mild degree of pelvic inflammation as a cause of irritation to the already overstrained nerves.

The occurrence of pregnancy and its normal completion is at best a complicated process of nature, and it is not surprising that inflammation from even a mild degree of pathology may, through the alteration of the secretions or in some more indirect way, interfere with the processes either before or after conception.

## BLADDER INFECTIONS

ONE phase of cystocele to which scant attention has been given is the residual urine and its relation to urinary tract infections. The bacteriological findings of the urinary tract in relation to the various pathological conditions is a subject still open to investigation. So far, even the question as to the normal sterility of urine seems to be debatable. In isolated instances considerable work has been accomplished by the bacteriologist, but generally without the collaboration of the physician.

Our writers of authority are content with meager statements.

In the *International Clinics* of recent date Burnett, of Edinburgh, writes:

“ Workers in this field at present are but pioneers and our knowledge but scanty. In fact, I am more and more convinced that we have still a wide field before us, in the bacteriological study of the urine in disease, and I feel that the time is not far distant when a bacteriological examination of the urine will be regarded as of even greater importance than ordinary chemical investigation.”

Wood, of St. Luke’s in New York, told the writer he would consider any bacteria in the urine pathological. In his book he states that the bacteria that may be found in the urine are very numerous, and the important species are the colon, typhoid, streptococcus, staphylococcus, gonococcus, and tubercle. He emphasizes the importance of differentiating the tubercle from the smegma bacillus, “as the smegma are common in urine, and may be even in a catheterized specimen. . . . The gonococcus and the tubercle bacillus are the only species in which a morphological examination is of much value.” And later: “The only morphological diagnosis which is allowable is unfortunately confined to two species, the tubercle bacillus and the gonococcus.” And again: “The casts give positive evidence of a kidney lesion.”

Hiss and Zinsser have nothing to say on the bacteriology of the urinary tract except to state the necessity for a catheterized specimen.

Osler's new work gives but one short paragraph to bacteriuria, and later states as his conclusion that vaccines have been used a great deal, but with little benefit.

Guiteras in his new work says:

"Although germs have been found in the urine of healthy persons, the majority of investigators state that the urine in health is sterile, provided it be obtained by sterile instruments and under proper precautions. During and after infectious diseases, germs are often found in the urine.

"Experiments have proven that the urine possesses bactericidal properties in health and have shown that the absence of bacteria from normal persons may mean that the germs have been destroyed by virtue of this property. The acid potassium phosphate supposedly being the protector, the neutralization by alkali destroys its bactericidal property. Possibly, the chloride may also act."

One of the most elaborate articles on bacteriuria is by Thomas R. Brown, in Osler's "Modern Medicine." He states:

"It is important to remember that the epithelium of this tract is extremely resistant to infection and that in the vast majority of cases certain predisposing factors must be met with before inflammation is set up. The weight of evidence, however, certainly points to the belief that the urine of healthy individuals if obtained under careful precautions contains no bacteria. That the organs and urine of absolutely normal individuals are free from bacteria has the weight of authority, and thus at the present time, at least, it is not fair to assume that we may have autogenous infections of the kidney."

Judging from the results obtained in bacteriological examinations of practically normal urine in a relatively large series of cases in women, I think that we are justified in concluding that a urine which contains a few germs to the cubic centimeter can practically be considered sterile. In only a few examinations have we found the urine absolutely free of all germs, though what would be considered a normal urine will show only a very few to each cubic

centimeter. When the method of collecting, the fact that the findings are uniform in systematic checking of individuals, and the results of ureter catheterization are considered, I think I am justified in assuming that these are not due to contamination from the urethra.

We know that in many infectious diseases the germs present in the body are eliminated through the urine, but give rise to no symptoms directly traceable to their presence.

This is also true of many infections of moderate severity that usually attract no attention to the urine. In case urine examinations are made, no chemical alteration of marked character is evident, even though the germs are present.

In order to be able to have a basis for comparing the degree of infections of the urine, we decided to determine the number and variety of the bacteria present by plate cultures. Through the number of bacteria found in each cubic centimeter of urine we believed the variations in progress might be recorded. However, there are many factors that make such determinations only relative. Some germs resist plate culture, thus making a tube growth essential to check the results. The quantity of urine secreted is bound to influence the proportional number of bacteria. The length of time between the obtaining of the specimen and the making of the culture is perhaps of greatest significance. This is on account of the loss of the normal bactericidal property in urine when left standing. In pathological urine the germicidal function is already destroyed, and the increase in the number of bacteria is consequently rapid.

Normal urine has a marked germicidal action, which may be due, as some think, to the various chemical substances present, or, as others argue, to the presence of a substance of the nature of a ferment. The fact that the urine loses its germicidal action a few hours after voiding, and also after the application of moderate degrees of temperature, gives possibly more weight to the ferment theory.

It is relatively easy to give rise to an inflammation of the bladder by careless catheterization, and it is not unusual to find acute cystitis in various forms of infectious diseases. Such cases are self-evident and respond readily to the ordinary methods of bladder

treatment, provided they are not associated with any bladder or kidney ptosis. If any urine stasis exists, the infection is more than likely to become chronic.

The cystocele of marked degree is seldom overlooked, and, consequently, is promptly treated; but there is a type of case on the border line which has so far been too often neglected. Such moderate conditions will often be diagnosed as cystitis and treated as such, but with the etiology unrecognized and uncorrected.

I believe that in women by far the larger proportion of chronic inflammations of the bladder are secondary to a bladder ptosis, caused by a relaxed vaginal outlet with resulting or associated sagging of the ventral vaginal wall. This bladder-sagging may not be enough to give any marked evidence of cystocele; but if it is sufficient to cause the retention of any urine, it can be accounted of sufficient importance. Poor bladder drainage may in some cases be due also to a relative ptosis from a displaced uterus. In women beyond the menopause the bladder symptoms may be the only ones present, though the misplaced uterus was the original pathology. It is the condition producing residual urine that is the direct etiological factor in the production of most cases of chronic cystitis in women.

In cystitis, if the residual urine is present, it is the factor of greatest importance, since it accounts for the return of many supposedly cured bladder conditions.

Urine retained in the bladder for any length of time undergoes ammoniacal fermentation, and, as a consequence, its chemical character is altered. The germicidal action due either to the inorganic contents or a ferment ingredient is then destroyed. It needs only the presence of some pathological germ coming from above in the urine, or introduced from below by mechanical interference, to cause the inflammation.

In a bladder whose function is interfered with any type of medication for cystitis can be of value only as long as it is continued, since, as a rule, such medication only inhibits the development of the germ. If by chance the germ is removed by treatment, the beneficial result endures only until a reinfection has an opportunity to come through the blood stream or from mechanical interference.

The following histories illustrate the effect of a moderate degree of bladder ptosis:

Mrs. B., aged 55. One child; menstruation ceased two years ago. Present ill-health dates from fall astride a bath-tub five months ago. Had cystitis twenty years before. The coccyx has been removed and the tissue around the perineum incised by a surgeon to whom she had been referred because of pain upon sitting down and frequent urination. The operation exaggerated rather than improved these symptoms.

She complains of frequent desire to urinate, especially when seated; when lying on back urination frequency is increased, but can lie face downward with comparative comfort; feels well, but is extremely nervous and depressed. Pelvic examination shows mucous membrane pale and atrophic; perineum shows scar of repair, but muscular support is poor; considerable irritation around urethral orifice and vestibule; small cystocele; uterus rather low, atrophic; bladder tender. Cystoscope shows bladder congested, otherwise negative, except for pouching of dorsal wall. Urine cloudy, alkaline; sp. gr. 1.010; trace albumin; culture shows colon and proteus.

Treatment consisted of vaccine and urinary antiseptics. A small pessary was placed to raise the bladder. In three weeks the urine was perfectly normal and bacteriological examination negative. The pessary corrected all other symptoms, but three weeks later had to be removed on account of irritation to the senile mucous membrane. The discomfort in sitting returned immediately, though there was less frequency of urination than before the infection of the urinary tract had been corrected.

Two months later the patient came, desiring operation, realizing that the majority of her symptoms were due to the bladder ptosis. The operation consisted of a ventral colporrhaphy with perineorrhaphy and abdominal suspension of the uterus. This accomplished permanently what the pessary had temporarily, and now, three years later, the patient sends word that she is in good health.

Mrs. A. B., aged 51. Has had one child; ceased menstruation at thirty-five years. Had just come from college hospital where gynecologist removed a urethral caruncle without any relief of symptoms. Complains of frequent urination, burning and pain on voiding, backache, and a sense of prolapse.

Examination shows considerable irritation around urethra from where caruncle had been removed. Vulva and inside of buttocks

show pruritus, probably from sugar in urine; small cystocele; uterus atrophic, although in normal position. Patient had attempted to empty bladder four times in forty minutes, but upon catheterization six ounces of residual urine was obtained, the bladder wall shutting down on catheter just as if a stone were present.

Chemical examination shows albumin; no sugar; culture, an acid-forming streptobacillus. Cystoscope shows a marked trabeculation and congestion of the bladder, a few bleeding spots, no foreign body, but considerable pouching of the dorsal wall.

A further report from medical clinic where patient had been under treatment confirmed diagnosis of diabetes mellitus.

Treatment consisted of urinary antiseptics and vaccine, vaginal canal being too contracted to use a pessary as a test of condition. Vaccine finally cured the infection, and thus lessened the frequency of urination, the patient being able to retain urine two hours.

On account of the diabetes, an operation was discouraged, but the patient's discomfort caused me finally to do a ventral colporrhaphy and perineorrhaphy. The incisions healed by first intention and resulted in a great improvement in the local symptoms. The general physical condition was improved.

This patient claims that she is well unless she indulges in sugar.

Mrs. C., aged 58. Two children. Ceased menstruation at fifty. Had no pathological menstrual history. Up to four years ago was fairly well, but since then has had gradually increasing trouble with the bladder. Complains of considerable pain just before voiding and frequently persisting for some time after. Also complains of a bearing-down feeling and general distress in the pelvis. Two hours is the longest interval between urinations, and at times, when worried or tired, the intervals are as short as ten minutes. Went to the Atlantic coast two years ago for medical advice, and while there a surgeon removed a urethral caruncle. Since her return her symptoms have been worse, though she has undergone the most careful, conscientious treatment for cystitis at the hands of a competent physician, who referred the case.

Examination showed a slight degree of vaginal relaxation; the mucous membranes senile; the tubercle of the vagina more exposed than normal, but only a slight bulging of vaginal walls when bearing down. The uterus was atrophic, retroverted, fixed. There was some thickening at base of bladder and left broad ligament. Cystoscope showed a congested bladder with pouching of dorsal wall. The catheter gave two ounces of residual urine. The urine had a sp. gravity 1.015, with a trace of albumin, some pus cells and

colon bacillus infection. The kidneys were not palpable, though there was some tenderness over the ureters. The fixation of the uterus with the small vaginal canal prevented the use of a pessary.

The operation consisted of a ventral colporrhaphy and a perineorrhaphy with a suspension of the uterus to correct the sag. The result has been that the patient has gained in weight, is free from bladder irritation, and, unless excessively tired, the frequency of voiding is normal.

The confirmation of the diagnosis of a case of this character must depend mainly on the bacteriological examination and the finding of residual urine. The cystoscope shows a bladder congested and sagging. The chemical and microscopical examinations of the urine are of only relative importance, for the elements of pus and albumin upon which the usual dependence is placed in the diagnosis of bladder inflammations are very variable constituents—sometimes in marked abundance, sometimes very scant.

For the bacteriological examination it is necessary to have a catheterized specimen. This is preferably obtained by means of a glass catheter with a rubber cuff protecting the end, taken directly from the lysol solution in which it was placed after boiling and introduced without other lubrication into the urethra after the orifice has been thoroughly washed off with a sterile antiseptic solution. The first portion of the urine is discarded, and then the flow is directed into a sterile bottle. The bladder is not completely emptied, for thus, I believe, we obtain a more uniform sample.

Though Kelly, of Baltimore, advises the removal of the rubber cuff before collecting the specimen, this is not necessary. If left attached and the end untouched, it is useful for directing flow into the sterile bottle. It is important that the patient take no urinary antiseptics for twelve hours preceding the catheterization.

Lately the current literature has been belittling the value of the hexamethylenamine preparations as antiseptics, and even such authorities as those from the Rochester clinics have decided that the antiseptic value was nil. It is true that individuals do not break up the drug in the body in the same degree, so the quantity of formaldehyde liberated varies. Thus, in some cases, large doses are necessary, in order to obtain free formaldehyde. Individuals naturally vary in susceptibility, and kidney irritation is not uncommon even

with small doses. These two objections, however, are not sufficient to justify discarding the drug. Our experience in a large number of bacteriological examinations of the urine has been that, unless the infection was a very severe one, the taking by the patient of any of the hexamethylenamine preparations previous to the examination interfered with the findings. It does not seem necessary even to have free formaldehyde present in order to produce some inhibition of the culture.

The determination of the residual urine is accomplished by having the patient urinate and then passing a catheter. In some cases the quantity obtained may be only a few drachms, but any considerable quantity obtainable after urination in the normal manner indicates the degree of sagging, and it is upon this ptosis that the infection depends. The fact that a nervous individual under excitement may secrete excessive quantities of urine must be remembered, for thus the findings will be modified. The finding of residual urine is of value only when taken in conjunction with the pelvic examination.

As has been mentioned indirectly in the histories quoted, we have in the ordinary hard-rubber pessary, where its insertion is possible, a valuable aid in determining the prognosis of operative interference. In fact, it is so good that a number of our patients will accept the pessary as a substitute for the operation.

Without operative procedures to overcome the residual urine, the prospect for a permanent cure is not good. The type of operation must depend upon the condition and aim to correct the incomplete emptying of the bladder.

In urinary-tract involvement in women it is impossible by symptoms alone to draw the line between the pathological conditions in the bladder and those in the kidney and ureters. When by chemical and bacteriological examination of the urine we have proven that an infection exists in the urinary tract, it is then necessary to decide as to the location of that infection. The presence of bacteria in the urine is not alone sufficient evidence of infection. If it is possible to exclude a systemic source as the cause of the bacterial contamination of the urine, it is fair to assume that the germs have their origin in the urinary tract. The bacteriuria of urinary-tract

origin is not necessarily associated with symptoms, though, as a rule, their presence is indicative of some pathology which gives its own symptom complex. Bladder contamination, with sterile kidney urine, and no pelvic infection to account for the presence of bacteria by direct extension, is suggestive of improper drainage. The bladder ptosis may have none of the signs and symptoms of cystitis apart from the irritable bladder. In the absence of kidney infection symptoms, when the kidney urine shows contamination, this contamination is most frequently the result of stasis above the bladder. The most common cause for such stasis is the floating, or movable, kidney.

Severe kidney conditions which give bladder irritation are naturally outside the scope of this work, though many such pathologies have as their beginning the conditions under consideration. Many symptoms and findings of bladder-urine stasis are also found with urine stasis above the bladder, but the movable kidney at the present time is given very scant pathological consideration.

As late as September, 1912, Hedges, in a paper read before the American Gynecological Society, wrote as follows, and to his statements no exception was taken by those present:

"Reverting to the subject of neurasthenia, just a word about floating kidney. We frequently find these two conditions in the same patient and used to jump to the conclusion that the movable kidney was the cause of nervousness, but fixing the kidney did not cure the nerves. If in one of these cases there are severe paroxysms of pain due to kinking of the ureter or pelvis of the kidney, and during these attacks of pain or just afterward marked urinary changes occur, then we are warranted in fastening the kidney. Morris has recently called attention to the splint-belly rigidity of the muscles overlying the organ on the same principle that the rectus protects an inflamed appendix. It seems only reasonable that a moderate amount of nephroptosis should be harmless, just as a moderate sagging of other viscera gives rise to no unpleasant symptoms."

Quoting from a personal communication from Dr. Guy L. Hunter, of Johns Hopkins:

"I suppose you refer in your question to the cases mentioned of stricture of the ureter. Of course, many of my hydronephrosis

cases are due to ptosis of the kidney, the hydronephrosis developing because of an aberrant vessel, as suggested by Mayo, or because of the ptosis of the kidney while the ureter is being held in its original position by the periureteral bands of the peritoneum. As to the bacteriological findings, it is rather significant that in my cases of stricture of the ureter which I credited to tonsil infection or toxemia the infection has been by the staphylococcus, unless the urine was sterile. As you know, most hydronephrosis kidney infections from all causes are by the colon bacillus."

Osler says far too much attention is given to the condition which is often associated with neurasthenia.

Says Lepine:

"It is uncontested that a displaced kidney is predisposed to the development of nephritis. Kinking of the ureter may cause changes in the excretion of the urine, but also stasis in the canaliculi, which is very favorable to the infection of the kidneys."

Strumpell says:

"In a great majority of cases of floating kidney, we have to deal with those familiar and frequent conditions of a nervous character which are termed hysteria or neurasthenia. It is not always advisable to apprise the patient of the fact, for with a person of this sort the mere idea of possessing a 'floating kidney' is enough to stir up a host of subjective symptoms—unless you wish to use it for suggestive therapeutics."

He advises elimination of every possible pathology before crediting the floating kidney with importance.

I quote the following statements from Dieulafoy's latest work on medicine :

"Edebohls, Box, and Newman have claimed to cure a one-sided nephritis by fixing a movable kidney—cases where the kidney was enlarged, painful, and the albumin abundant. The movable kidney was supposed to be exempt from lesions for a long time. Although the cases reported by Edebohls do not give all the medical details of the question, it is none the less true that people with movable kidneys have albuminuria. The albumin is present in fourteen per cent, according to Schilling. The term Bright's disease implies the idea of bilateral nephritis. The presence of albumin and casts in the urine is not sufficient to prompt the diagnosis of Bright's dis-

ease. This confusion is made by surgeons. It may falsify our ideas. I am of the opinion that in some of the published cases, nevertheless, it does seem that tuberculosis was not present and that they were really cases of chronic unilateral nephritis without pain and hematuria. It is certain that results of surgical intervention are often excellent in unilateral acute or chronic nephritis, but it is indispensable to state clearly the indications and contraindications and select cases amenable to operation. For the time being, we are unable to answer this question because many of the published accounts are incomplete from a medical point of view. I am convinced, however, that this gap will soon be filled."

The consensus of opinion seems to be that the movable kidney is very common, and may occasionally be associated with diverse morbid conditions without causing original symptoms. But a diagnosis of movable kidney is very questionable unless the kidney is definitely giving trouble by pain, hematuria, and abdominal tumor, with possibly gastralgia, nausea, and vomiting, and occasionally an intermittent hydronephrosis.

All writers acknowledge the coincident occurrence of mental and nervous disorders and movable kidney, but none see any significance in the fact or offer any explanation. Alienist writers have frequently demonstrated the variations in blood pressure that are so often coincident with the aggravations of mental disorders, and are inclined to look upon toxemia as a cause, and that probably of intestinal origin. A clinical study of the urine in cases with movable kidney in connection with this blood-pressure investigation should be of interest.

By the presentation of some clinical cases I can best summarize the results of my study of the bacteriology of the urine with special reference to movable kidney.

Miss C., aged 24, complains of severe pain at menstruation, relieved when flow commences. Has some pain after urination, and occasionally has to void frequently. When seated vulva is sensitive. Has been treated in the East. Examination shows introitus normal except for eroded area external to fourchette. Uterus slightly retroverted, with cervix flexed on body so that os and fundus are in line; os very small. Appendages on left side thickened. Right kidney low, tender, enlarged; tenderness along course of both ureters. Examination of urine gives trace of albumin. Specific gravity 1.020

with some cell detritus, and on culture the staphylococcus alba. Cystoscope shows bladder normal except for some congestion at orifice of right ureter. Catheterization of ureters gave twice the quantity of urine from the right side with a specific gravity of 1.006; trace of albumin; occasional leucocytes, but no casts. Animal inoculation of separated urines gave no results. X-ray pictures were negative. Vaccines and systemic treatment gave some help, but did not cure, although for weeks at a time urine would be normal. A thorough dilatation of the cervical canal done previously to the investigation of the kidneys cleared up the menstrual pain.

Miss M., aged 36, complained of backache dating from fall two years ago. Had a definite Dietl's crisis in October, 1911, followed by suppression of urine and a temperature of 103° with uremic symptoms. Had a pulmonary tuberculosis some years ago. Examination shows practically normal, though somewhat undeveloped, pelvic organs. Abdomen has scar from an appendectomy done six years ago, at which time there was no kidney condition. Abdominal palpation presents a very tender, somewhat enlarged low-down right kidney, left kidney not palpable. Investigation of urinary tract shows a normal bladder with a depressed opening of right ureter. The urine from the right kidney showed 125 c.c. in an hour, and returned fifteen per cent phenol sulphophthalein; was clear in color and excreted in continuous drops. The left urine totaled 110 c.c., and gave also fifteen per cent coloring matter. The microscopical examination showed a few white blood cells and some granular debris, with the greater quantity on the left side. A trace of albumin was present in the right urine. Bacteriological examination of the right urine showed a streptococcus and a large bacillus; of the left the large bacillus alone. The guinea-pig inoculation showed no tuberculosis. There was no evidence of stricture or hydronephrosis.

This patient has been cured of her backache and bladder symptoms by Longyear's operation on the nephrocolic ligament combined with fixation of the capsule. Concurrently with the improved symptoms, the bacterial count in the urine rapidly diminished, until now a practically sterile urine exists with only twenty-eight bacteria to the cubic centimeter, compared with the uncountable number preoperatively.

Miss B., aged 25, has been in many physicians' hands with varying diagnoses, with conformity by only two on a tuberculosis of the right kidney. She is better now than for some years, but suffers from severe backache. About once in six months she has an attack of pain in abdomen and diarrhea with much fresh blood. She had

a hip trouble fifteen years ago. She states that in 1908 tubercle bacilli were found in the urine, and improvement followed tuberculin. Examination shows an enlarged, tender movable kidney low down; no ptosis of the left. The cystoscope shows no bladder abnormality. The quantity of urine from each kidney is practically the same, but the right shows more normal character of flow. The phenol sulphophthalein shows up in four minutes from right side and in four and a half from the left. The proportional elimination is the same with a total return of sixty per cent in two hours. The urine from the left kidney gives twice as much urea; both show a trace of albumin and some blood cells, but no casts. Bacteriological examination of bladder urine gives an uncountable number of a streptococcus and a staphylococcus. With guinea-pig inoculation the urine of both right and left kidneys shows a negative finding.

This patient improved with urinary antiseptics and a corset, and six months later submitted to operation. Four months after operation all the symptoms had subsided, and there were less than a hundred staphylococci to the cubic centimeter of urine, the streptococci having disappeared. Two months later, with still no medicinal treatment, the urine contains only twenty-eight staphylococci to each cubic centimeter.

In these three cases I infer that we have the "unilateral nephritis" of Dieulafoy. He believes that many are due to tuberculosis. I would go a step further and add that all of them are germ conditions. They are in no sense a "Bright's disease," but are secondary to a displaced kidney interfered with in function. And I believe that in the bacteriological examination we have our data for the exact medical classification he desired. In neither case was the urine from the normal kidney free from growth, but this growth was always less pathogenic, and with its germs so few in number that for all practical purposes the urine was considered sterile. The unimpaired function showed that a Bright's disease did not exist.

I have shown, I think, that we cannot cure these cases without support, and I believe operation is indicated. These cases are the type of movable kidney that one can not overlook, on account of the local symptoms; but the following cases I have selected to show that before that stage is reached the movable kidney is giving trouble and is gradually developing into the gross type:

Mrs. D., aged 30, has had one child, born in a difficult labor. Three years ago she had a good surgeon correct the pelvic pathology. Her present complaint is backache and pain in the right side and a bladder which voids excessively when she is tired. Examination shows a fairly normal pelvis and good results from the plastic work. She has a low, tender right kidney and tenderness at McBurney's point—a frequent concomitant of movable kidney, and not always indicative of appendix inflammation in these cases. The urine gives a growth of a staphylococcus in large numbers with a few streptococci. A corset has stopped the backache and sideache, which was partially due to a tender sacroiliac joint and partially to the kidney ptosis, and now the urine is practically sterile.

Mrs. H. B., aged 40, complains of attacks of weakness in the left side and sometimes when the bowels move. These came on after helping her neighbors move a heavy table. I corrected some pelvic pathology seven years ago. Following these weak feelings, the quantity of urine is increased, and the frequency of voiding greater. The patient has a low, tender movable left kidney. The urine gives an uncountable number of staphylococci. The patient is too thin to have a corset fitted perfectly, but the best we can do has improved her much and the urine has become sterile.

Mrs. E. B., aged 27; no pregnancies; operated for retrodisplacement by one of our best surgeons three years ago, but still continues to be weak, nervous, nauseated, and subject to headaches, with pain in bladder after urination. The bladder has been abused by the stitching of the uterus to the anterior abdominal wall; otherwise the pelvis is normal. The right kidney is movable and tender; the left less so. There is no enteroptosis. The urine gives an uncountable number of staphylococci to each cubic centimeter. The patient improved with her corset and the medical treatment; but on developing kidney crises an operation was done. All symptoms have disappeared, and examination of the urine gives a bacteriological count of fourteen germs to the cubic centimeter.

During nine months' observation of this patient, it was found impossible to obtain kidney support with corsets, and many bacteriological examinations of the urine gave germs varying from a few hundred to the cubic centimeter in her best weeks to uncountable numbers at times of symptom exaggeration. The operation showed a small soft kidney without scars. The organ was held by the suture of a well-defined nephrocolic ligament and capsule fixation. The bacterial count of the urine has decreased to what I consider normal.

Mrs. P., aged 31, referred on account of a badly lacerated cervix, has worn a kidney belt the last year to correct a right-kidney ptosis which supposedly came from a bad fall. After the correction of the cervical condition, a corset was advised in place of the belt, which had aggravated the pelvic pathology. The right kidney was easily palpable; the left less so; but neither tender. Two bacteriological examinations of the urine at two months' interval gave sterile results. A month ago, or six months after corset was first fitted, the patient returned complaining of some dragging-down feeling in the right side. It was found that the corset had stretched sufficiently to allow the kidney to remain lower than normal. The organ was tender and the urine culture gave a streptococcus and staphylococcus albus, about 250 to each cubic centimeter.

Mrs. N., aged 24; never pregnant; complains of backache and bladder irritation, general weakness and painful menstruations. Has been through several minor and major operations; is now wearing a stem pessary to correct a supposed stenosis. Pelvis considerably congested, probably accounting for the bladder irritation, as urine examination chemically and bacteriologically is negative. Right kidney movable, slightly tender. Bacteriological examination of the urine in October and December negative. The pelvic congestion, painful menstruation, and bladder irritation have cleared up with local treatment and discarding of the pessary. In March, she came complaining of weight and drag in right side. Examination showed poorly fitting corset and staphylococcic infection of urine. A new corset corrected the symptoms, and now, three weeks later, the urine is sterile.

These cases are typical examples of a large class of patients in whom there is a movable kidney that is the cause of the trouble, but this pathology is overlooked unless it is associated with a Dietl's crisis. Many of them have been operated upon for pelvic pathology, without complete relief.

I realize that it is too early to make any too positive claims for the diagnostic value of the culture in urinary-tract stasis, but the findings show that in every case in which the condition can be considered pathological we have bacteriological evidence in the urine, except in some cases of kidney ptosis which give the acute crises.

It may be well asked why so many displaced kidneys give no symptoms. I believe that in every displaced kidney is a latent possibility of trouble, but as long as the individual is in good physical

condition, the peristaltic action of the kidney pelvis and ureter is maintained, and this prevents urine stasis. This peristaltic action is of vast importance in preventing the posture of the patient from interfering with the kidney function.

In the catheterization of the ureters of such kidneys as are described in the three cases of the so-called "unilateral nephritis" quoted, there is an absence of the rhythmic action of the muscles, so that the urine leaves the catheter from the affected side in continuous drops. Some urologists state that this is a sign that the catheter has reached the pelvis of the kidney. In the normal individual this may be so, but a patient with urine stasis above the bladder shows the same sign even when the catheter is inserted only a short distance. In such cases it indicates either a dilated pelvis and ureter or the loss of the normal peristaltic action.

In any kidney-sag it is only a question of time when the over-worked muscles will stretch, as does a labored heart, and thus permit stasis of the urine. The consequent alteration of the chemistry of the urine permits the growth of certain germs entering from the neighboring organs or from the blood stream. Whatever congestion results will add to the handicap under which the organ works. It is not a question so much as to the kind of germ present as it is the absence of sterile urine which is of significance in movable kidney.

Continued investigation of the urine from the bacteriological side has convinced me that more accurate and valuable data are obtainable from a count of the number of germs to each cubic centimeter of urine, and for this suggestion I am indebted to Dr. Archibald.

We feel that we are justified in considering a urine containing only a few germs per cubic centimeter a normal so-called sterile urine. In all cases truly pathological the count will run from a few hundred to an uncountable number, depending on the severity of the pathology. Frequently more than one variety of bacteria is present, though if one predominates it may, by its development reaction in the culture medium, destroy the other growths. Naturally, this has to be borne in mind in checking up the findings and in preparing vaccines. It will also emphasize the necessity for autoge-

nous vaccines and may account for imperfect results from these agents.

The operative treatment of kidney-sag has been considered indirectly in connection with the histories quoted, and since it is hardly within the range of this monograph it will not be considered in detail.

I have shown the necessity for correcting bladder-sag in order to cure a cystitis. The principles involved in kidney ptosis are analogous. We have a certain amount of stasis; and with this stasis the urine is altered and loses its claimed antiseptic action. If a pyelitis develop through the entrance of pus-forming germs, the giving of drainage is of prime importance in treatment, and not until that is accomplished can we expect results from vaccines.

The best method of correcting the ptosis is a debatable question at present. We have swung strongly from the kidney fixation, largely, I believe, because too many tried to cure movable kidneys associated with enteroptosis in that way. The cases not being segregated, many a movable kidney was corrected when the pathology from which the patient suffered was situated elsewhere. Again, many cases recurred and were accounted for by one of two causes: first, those enteroptotic cases where kidney fixation without support of the other organs could never be expected to stay; second, the neglect of the abdominal support so necessary to use until the kidney has had time to reform its own bed. If the patient can be fitted with a proper front-lacing corset, we have, with that, the means of testing out our diagnosis as with a pessary in bladder ptosis; but that, of course, is only a palliative method. Against the regular kidney belt I wish to enter a protest, for no other abdominal contrivance has such a power for evil in developing congestion in the pelvic organs. In a thin individual I have seen the two-part surgical corset produce kidney crises by pinching the ureter, and in that type of individual the hope of fitting any kind of a support is rather forlorn. After operation the abnormal posture of these individuals should be overcome by a corrective corset properly fitted.

From the standpoint of my clinical findings, summing up the question of bacteriology of the urine, I believe that under normal conditions of body functions the urine is practically free from bac-

teria; but with any systemic germ infection the abnormal agents are in a large degree eliminated from the body by the kidneys. These germs in a urinary tract with normal drainage have little chance to produce abnormal symptoms, since the normal rapid elimination and the germicidal action of the urine prevent development. To all intents, they can be looked upon as of no pathological significance, unless through the great virulence of the infection and the patient's poor resistance they form part of a general septicemia. If, however, in the course of the urinary tract there is an interference to the normal escape (so that an actual or relative retention occurs), the urine itself so changes its chemical character as to afford a favorable culture medium. Whether this is due to the destruction of the ferment or to the presence of altered chemical salts is problematic at present. We know, however, that urine heated a few degrees over body temperature or let stand for a few hours outside the body serves as a good culture medium, and as such was used by Pasteur in the early days of bacteriology.

In typhoid fever and in other diseases in which the germs are present in the blood stream we find them recoverable from the urine, and yet without attendant symptoms of urinary tract infection. Experimental intravenous injections of cultures have shown that germs can be demonstrated in the urine within fifteen minutes. These facts justify us in assigning a germ-excreting function to the kidney and show the necessity of some associated pathology for the production of a urosepsis.

Not only in bladder ptosis, but also in that of the kidney, we can prove by temporary support that the urosepsis is dependent thereon, and operative correction properly done emphasizes the fact.

The very fact that seldom in our examinations of urine do we find only one germ present makes more probable the autogenous theory of infection. Consequently, this prevents any conclusions of value being deduced from the character of germ present outside of the self-evident fact that the severity of the symptoms will depend on the characteristics of the germ. Yet even active streptococci are frequently present without producing symptoms when no stasis complicates the urine discharge.

Like many other observers, I have found that in cases of uro-

sepsis in which the bacillus coli communis is present it is almost impossible to eradicate the germ completely, though the patient to all intents has been cured.

Some bacteriologists believe this continuance of the colon bacteriuria is due to the low type of the organism and the character of the mucous membranes of the bladder, rather than to the fact that the colon is naturally a habitant of the body and proof against its defenses.

## KIDNEY PTOSIS

A STUDY of sixty-five cases of movable kidney (made with special reference to the bacteriological aspect) has produced data of considerable interest. In these cases I do not include those patients with general enteroptosis; nor are those with acute infection, the pus kidney, or the tuberculous infection considered.

The acute kidney infections are mostly associated with general systemic involvements. If the virulence is great or the patient's resistance poor, the breaking down of the parenchyma occurs and the "pus" kidney develops. Otherwise, the process subsides, responding more or less promptly to therapeutic measures unless a urine stasis exists. If there is any interference with the urine escape, the inclination to chronicity is present, and the pathology becomes resistant to medication.

Patients with general enteroptosis are excluded from this study because there are in their pathology so many other factors that must be considered as likely to complicate the findings.

As has been seen, the simple presence of bacteria in the urine is not diagnostic of urogenital-tract infection. For, though the consensus of opinion is that urine in normal individuals is free from germs, some observers report a considerable percentage of presumably healthy individuals whose urine contained bacteria. Many individuals with no urinary symptoms may have the urine loaded with germs. Any germ free in the blood stream makes its appearance in the urine after a short interval of time. Thus germs introduced through intravenous injections of cultures are recoverable from the urine, and in systemic diseases such as typhoid the bacteria are also found.

The urine has germicidal power, as shown by the decrease in the number of bacteria during the first few hours after voiding, but this action is not marked, and is readily destroyed by slight modification, such as comes from exposure to air or moderate degrees

of heat. The urine from an infected bladder and kidney has already lost its germicidal power through chemical changes previous to voiding, so that after expulsion the increase of the number of germs is rapid. In order to avoid too great a variation from such a cause, the quantitative determinations have been made as early as possible after catheterization. However, for clinical purposes the variation in twelve hours is not of great consequence.

The frequency of the occurrence of bacterial contaminated urine must justify the conclusion that associated with bacteriuria there is present a predisposing factor that determines the production of kidney infection. With this factor in mind, a study of the bacteriology of the urine in movable kidneys was undertaken. A necessity for a classification of the varieties of kidney ptosis early became evident; and to meet that need the cases were divided into four groups, using the clinical and bacteriological symptoms as a basis.

The first group consists of the cases of so-called "unilateral nephritis." Here a usually right-sided involvement is found. The kidney is low, easily palpable, tender to the touch, and somewhat enlarged. There is bladder irritability, though inspection reveals nothing but possibly a congested mucous membrane with a reddening of the right ureter orifice. The urine shows some albumin and pus, a few casts, and numerous bacteria, but these vary from time to time. The patient complains of a dragging feeling with dull pain in the right lumbar and hypochondriac regions. These cases seldom exhibit Dietl's crises, but are often associated with periodical uremic attacks evidenced by headache, fever, puffiness of the face, and lessening of the urine output.

As has been stated, the classification of this pathology as a "unilateral nephritis" is not technically correct, for the term "nephritis" is too intimately associated with Bright's disease to convey any other impression. Such cases are invariably germ involvements of the kidney pelvis, and what changes take place in the kidney parenchyma are wholly secondary to the infection.

The patients exhibiting definite Dietl's crises come into the second division. The attack of pain known as a crisis most frequently comes if the patient suddenly assumes the standing posture. The pain is accompanied by faintness and occasionally a variation in

urine secretion, not only as to quantity, but also in chemical and microscopical findings. The symptoms are relieved by the recumbent posture, and the attack may be followed by a tenderness of the kidney, persisting for a few hours. During the interval between attacks the urine may exhibit absolutely no abnormal changes.

Occasionally one sees cases that must come under this head even though no pain is complained of, where a sudden fainting is the primary symptom. It may be that these patients are extremely susceptible to pain, and that the complete unconsciousness is the result of the pain stimulus, but that symptom is forgotten. The suggestion of Dr. R. A. Archibald that anaphylaxis may enter largely into this type of attack is of interest. Anaphylaxis (or allergy, as Von Pirquet terms it) depends on periodic proteid splitting. The absorption of these split products gives rise to definite clinical symptoms peculiar to the type of proteid present, but necessarily these periods of abnormality must be separated by a considerable interval of normal metabolism. It is reasonable to suppose that, in a patient with free urine drainage that suddenly becomes disturbed, the chemical changes taking place can readily cause marked disturbance. The two patients that I have seen with this type of attack have had more marked urine changes and more prolonged uremic symptoms than those patients with classical crises. Since the ptosis was corrected, these patients have had no recurrence of their fainting spells.

These two groups are well-recognized pathological entities. Under the third group should come the cases that might be said to be of questionable etiological importance. It is to this class of cases that the already quoted criticism of Strumpell and Osler apply. In these cases the kidney is readily palpable, the left almost as frequently as the right. The organ may not necessarily be tender, and usually is only slightly enlarged. The patient complains of headache and some backache with occasional irritability of the bladder. The nervous symptoms are often marked and of almost any type. If the right kidney is the one at fault, digestive disturbances are present, due to the close relation of the cecum and kidney. Upon examination the bladder is usually found healthy, and the urine may show absolutely no changes except from the bacteriological

side. If, however, the germ present is in excess, a trace of albumin and a few casts are present. It is in these patients that the results of the bacteriological examination of the urine are of most significance as an aid to diagnosis.

Under the fourth head are classified the patients with kidney ptosis in whom no symptoms can be found traceable to the condition and who show on examination a relatively sterile urine. I say "relatively sterile," because only a small per cent of specimens are absolutely free of germs. Out of one hundred and twenty-five examinations made in the type of case under consideration there were only three specimens absolutely sterile.

In the one hundred and twenty-two examinations in which growths were obtained, twenty-six patients, who could not at the time be considered as suffering from the effects of the kidney displacement, gave twenty or less colonies per cubic centimeter in thirty-two examinations.

Of the sixty-five cases of kidney ptosis investigated, five patients suffered with definite crises, two of whom had marked uremic symptoms associated. In two of these same five cases, including one of those with uremic symptoms, the urine had never more than twenty germs to the cubic centimeter, even following a marked attack, and the urine was without variation in the two kidneys. Two others of these five cases had more definite local kidney symptoms, and the urine upon culture gave counts varying from two hundred and ninety-four germs per cubic centimeter upward to an uncountable number. After operation on these two patients to correct the kidney displacement, the count dropped to below twenty per cubic centimeter, and has remained so consistently for over six months, associated with general good health.

Four cases of unilateral nephritis of the right kidney have been carefully investigated. Two have been cured by operation, and two have been improved by corsets and treatment. Cystoscopic examination in each case showed negative bladder findings, except for some congestion of the orifice of the right ureter. The kidney function was not impaired, though the quantity secreted by the separate kidneys was not equal. In three cases the larger quantity came from the abnormal side, but of decreased specific gravity.

On this side also there was no rhythm to the discharge. The bacteriological count differed in each kidney, the number on the right side being uncountable. On the left not over four hundred appeared in any examination. In all cases there was a mixed infection. Careful guinea-pig inoculations gave no evidence of tuberculosis.

The character of any kidney infection will depend on the primary location, the type and virulence of the germ, and the patient's resistance. A severe involvement in the parenchyma will lead to abscess formation and kidney destruction. Rosenow's findings that the selective tendency of germs depends on the type of virulence may possibly account for either a parenchyma or a kidney-pelvis involvement.

My conclusion is that the unilateral nephritis is essentially a kidney-pelvis condition with a certain amount of parenchyma congestion as a sequela, for it is devoid of the systemic and blood signs of an acute septic condition. It is invariably imposed upon a displaced kidney, and the condition promptly responds to operative replacement of the organ that permits improved drainage. When treated by corset support and therapeutic measures, improvement takes place, but there is a tendency to recurrence of the more acute symptoms.

The corset support promptly decreases the bacterial count to a marked degree, but during its omission the increase is again rapid. A woman of sixty-five, whose pathology occurred following the grippe, had on the diseased right side an uncountable number of germs, and on the left side four hundred and thirty-two to the cubic centimeter. The corset correction reduced the count on both sides to less than half the number. In two other non-operated cases the results were more marked.

In the two cases operated upon, the bacteria practically disappeared from the urine within a few months, the decrease being uniform and rapid. The symptoms were relieved immediately; the patient promptly gained in weight, and had no recurrence of the uremic signs.

An interesting feature in these patients with unilateral nephritis is the presence of a considerable number of bacteria in the urine

from the supposedly normal side. But the urine of this side shows a more rapid decrease in the number of bacteria following surgical correction of the abnormal kidney.

The findings in the class of cases listed as of questionable etiology were also well marked. The number of bacteria in the urine never reach the amount found in the "unilateral" type, but corset correction always produced a marked decrease—with a prompt increase if omitted. With the lessening of the germ the symptoms disappeared to reoccur when the count again increased.

The factor at fault is without doubt poor drainage, since the urine through chemical changes becomes a suitable culture medium for germ increase. The number of bacteria is relatively an indication of the degree of stasis.

If we can eliminate the cases that have a bacterial count depending upon a bladder involvement that is the result of bladder ptosis, or upon pelvic inflammation, we have an index in a measure of the disturbance the kidney ptosis produces.

The type of germ found seems to be of little importance. The varieties will vary in the same individual from time to time, and, as a rule, a pure culture is seldom present.

The results obtained so far from the bacteriological examinations in these cases seem to justify the conclusion that urine containing a relatively small number of germs may be considered normal. In seemingly normal individuals a perfectly sterile urine is rare, and this must emphasize the fact that bacteria are being constantly eliminated by the kidneys. Taken in conjunction with the experimental inoculations and the occurrence of germs in the urine in systemic infections, it is essential to acknowledge a germ-secreting function to the kidney. This factor necessarily increases the importance of the presence of a kidney ptosis that may interfere with drainage.

With the kidney ptosis of no matter what degree, the question of its bearing on the patient's health is one of individual determination. The amount of trouble from the ptosis depends more upon the interference with the urine flow and the amount of stasis produced than upon the particular location of the organ. The stasis alone may result in symptoms of a uremic character, but on the

kind of infection imposed will depend the degree of general pathological disturbance. The degree of stasis and the amount of infection necessary to give rise to symptoms essentially pathologic depend very largely upon the patient's sensitiveness to defective physiology.

If the peristaltic action of the kidney pelvis and the ureter is perfect (unless an acute obstruction occurs, as indicated by a crisis), the ptosis can be accepted as one not requiring correction, but we must realize that in every such individual the foundation for future trouble is present.



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